One of America's Famous Trains

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THE NEW YORK, CHICAGO and ST. LOUIS RAILROAD COMPANY

DEPENDABILITY has long been associated with the Nickel Plate Road—and today, in its run between Chicago, Cleveland, Buffalo and New York City, (D. L. & W.) the NICKEL PLATE LIMITED sets a standard for modern railroad travel comfort that is as luxurious as its service is dependable. Air-conditioned equipment includes Pullman bed-room cars and lounge-buffet cars, as well as section and drawing-room sleeping cars. Modern, fast, reliable, the NICKEL PLATE ROAD protects its equipment with track maintained for high speeds and heavy loads. For main line installations, HY-CROME A•REA*ctive* Spring Washers insure adequate protection between maintenance periods with greatest economy.

Reliance HY-CROME *Spring Washers*

A • REActive Deflected	THACKERAY	HY-REACTION	STANDARD	HEAVY DUTY	DOUBLE	BONDING
Meets A. R. E. A. Spec.	*For screw spike use*	*For track bolts*	*For general use*	*For frogs—crossings*	*For special use*	*Used as rail*

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Sales Offices: New York • Cleveland • Detroit • Chicago • St. Louis • San Francisco • Montreal

THE DRIER THE TRACK THE LESS THE MAINTENANCE

Draining a stretch of wet track with Armco Perforated Pipe. Water pockets were tapped at various depths, at intervals from 25 to 50 feet. Note water flowing out of pipe.

"THE day will soon come," predicted a leading railway engineer, "when a wet track will not be tolerated under any circumstances."

Speaking from experience, he knew that the many miles of Armco Perforated Iron subdrains had definitely reduced maintenance costs to a minimum and had made high speed traffic a safe possibility on his lines.

Armco engineers are ready to work with you on any of your wet track problems. Ask for data showing actual savings made on many such jobs.

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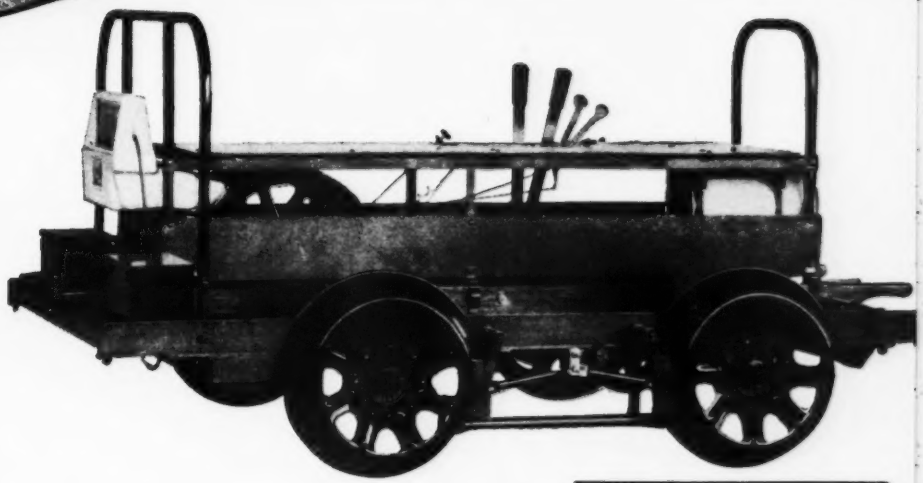
ARMCO PERFORATED PIPE INSURES BETTER TRACK

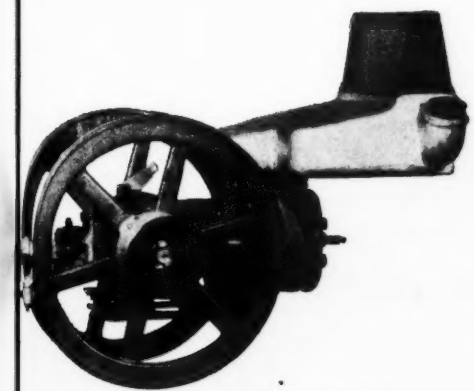
Published monthly by Simmons-Boardman Publishing Company, 105 W. Adams St., Chicago, Ill. Subscription price, United States and Possessions, $2.00; Canada, $2.50; Foreign $3.00. Single copies 35 cents. Entered as second-class matter January 20, 1933, at the postoffice at Chicago, Illinois, under the act of March 3, 1879, with additional entry at Mt. Morris, Ill., postoffice. Address communications to 105 W. Adams St., Chicago, Ill.

FOR LOW COST

1 to 6 Man Light Section Car



M14 SERIES E



Many years of universal service on railroads has proved the efficiency and dependability of this Fairmont Model O Engine which has been consistently improved and is now applied to six Fairmont cars.

DESIGN, sturdy construction, and surplus power—these three elements are built into this Fairmont M14 for the delivery of a wide range of service at record low cost. It is Fairmont's latest Light Section Car with a rear pick-up of only 105 lbs. so that one man handles it easily . . . yet it carries 6 to 8 men and also fits into jobs that call for trailer or push car work. It is powered with a surplus for the heavier duties by the famous Fairmont Model O (5-8 H. P.) Engine that railroad men know for its dependability and economy—the same engine that furnishes power for five other Fairmont cars. This car has all the operating and economy features of the M14 in aluminum, the chief difference being that the frame is of reinforced steel construction, to combine *low initial cost* with that *low over-all cost* which is the characteristic of all Fairmont Cars.

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Inspection Motor Cars . . . Section Motor Cars . . . B & B and Extra Gang Cars . . . Gas-Electric Ditchers . . . Shapers . . . Ballast Cleaners . . . Ballast Drainage Cars . . . Mowers . . . Weed Burners . . . Extinguisher Cars . . . Power Cars: Air, Electric, Paint Spray, Tie Tamping . . . Rail Coaches . . . Motor Car Engines . . . Push Cars and Trailers . . . Roller Axle Bearings . . . Wheels and Axles

Performance ON THE JOB COUNTS

Fairmont

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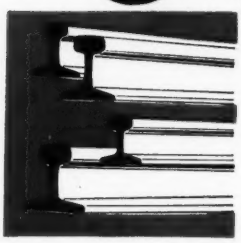

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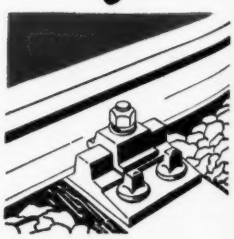
Carnegie, Illinois, and Tennessee Rails provide greater safety and dependability under modern high speed traffic—through careful control of steel quality and processing—and rigid adherence to specifications.



GEO TRACK CONSTRUCTION

GEO assures smooth, quiet track—greater safety—lower maintenance. GEO aids in preventing rail tilting and gauge widening.

Steel Structures of all classes, turntables, transmission towers and component parts • Black and galvanized sheets, automobile sheets, electrical sheets, sheets for special purposes, tin and terne plates; Keystone Rust-Resisting Copper-Steel Products; USS Stainless and Heat-Resisting Steel; USS High Tensile Steel • Rails and track material

United States

THE BACK—

THIS "*STEEL*" CAN TAKE IT

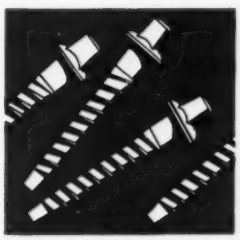
ON some "dog" branch line, pre-war track may be adequate for the traffic. But out on the main lines where the big 2-8-4's, the new 4-8-4's, and the newer streamliners run, it takes "steel" of real dependability to stand up.

And steel is ready for these new demands. Better furnace practice, advanced metallurgy, new means of inspection mean rails of more uniform quality, higher resistance to impact, less likelihood of transverse fissures. New methods of heat treatment have provided switches, frogs, and crossings with end-hardened rails that show less batter under heavy service. GEO Track Construction has demonstrated in many installations its ability to take punishment and to provide smoother, safer trackage.

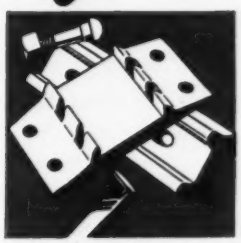
Among the subsidiaries of United States Steel Corporation, research is constantly advancing the quality and dependability of rail and track materials. Little known stretches of tangent track and curves are slowly but surely proving and testing rails and other products, supplementing the laboratory studies that aid in keeping pace with the developing needs of the railroads.

modern track requirements

LORAIN SWITCHES
The Lorain process—positive heat-treating control—assures longer life and greater safety for switches, rails and crossings.



SCREW SPIKES
Screw spikes give tighter fastening, hold to a minimum the mechanical wear between the tie and the plate—add to the stiffness of the track structure—aid in maintaining smoother, safer track.



TRACK MATERIALS
Strategic locations throughout the country assure the availability and understanding service so important in a source of supply for track materials.

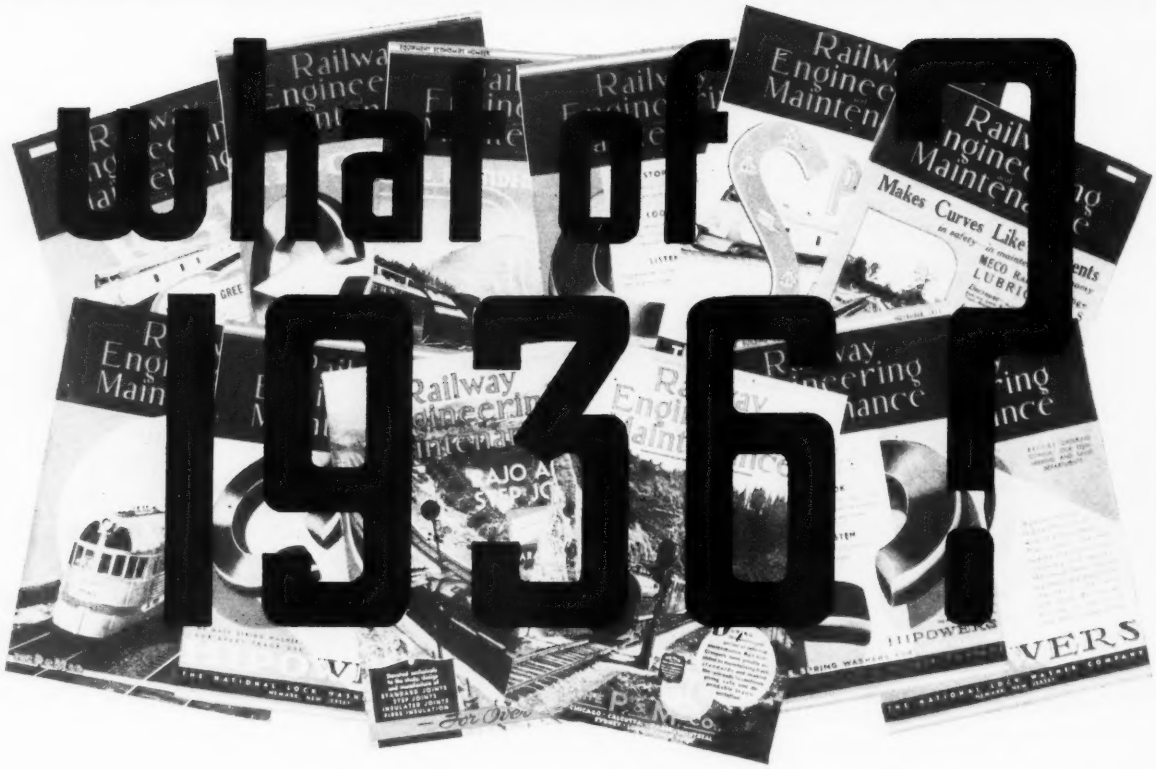
NEW LITERATURE—SEND FOR YOUR COPY
A 32-page book on GEO Track Construction explains the principles of this superior method—lists and describes some of its outstanding installations.

GEO Track Construction • Wire fencing, barbed wire, wire rope, electrical wires and cables, nails, manufacturing wires, cold rolled strip steel. Springs • Concrete reinforcement • CB Sections, structural shapes, piling, plates, bars, flats, billets • Cyclone Chain Link Fence — also lawn fence, wire screen cloth, wire belting, and wire specialties.

Axles • Wheels • Special Track Work and Accessories • Standard pipe, copper-steel pipe, rotary rolled pipe, electric-welded pipe, hammer-welded pipe, boiler tubes, seamless mechanical tubing, special dipped and coated pipe, cement-lined pipe, cylinders, couplings • Universal Atlas Cements.

Steel USS *Corporation Subsidiaries*

TO RAILWAY SUPPLY MANUFACTURERS



ANOTHER season's work has closed. Annual inspections have been completed. Next year's programs are in the making.

The needs are great. Six years of restricted maintenance cannot be ignored. Neither can the increasingly exacting demands of tomorrow's traffic—to say nothing of the necessity for making good today's wear and tear.

Traffic—and earnings—are increasing. Carloadings have exceeded those of 1934 for 14 weeks. Net operating income for October was the largest for any month in five years.

Orders follow earnings. Within the last few days one road has ordered 100,000 tons of rail and fastenings—another 33,600 tons, etc.

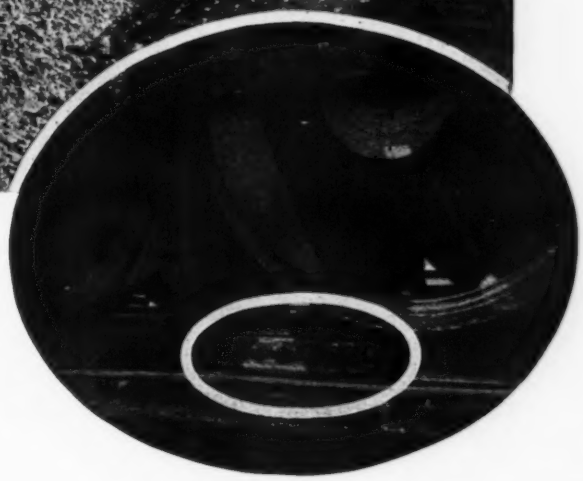
The problem confronting railway maintenance officers is one of selection. They cannot possibly purchase all of the materials they need.

Are you telling the story of your products to those subdivision, division and system maintenance officers (the readers of Railway Engineering and Maintenance) who are now preparing next year's programs and selecting the materials and equipment needed therefor?

Are you including, as a part of your sales program, a schedule in Railway Engineering and Maintenance that will keep your products before these officers throughout 1936?

Maintenance Mike Says: "I've always noticed that when traffic picks up, we get more materials. The chief told my roadmaster the other day to prepare for more work next year."

RAILWAY ENGINEERING AND MAINTENANCE IS READ BY MAINTENANCE OFFICERS OF ALL RANKS



25% to 40% LONGER RAIL LIFE

where Welding eliminates these Weak Spots

And, longer rail life is but one of the many economies effected by welding rails into long, continuous lengths. With rail joints eliminated, frequent track lining and surfacing become unnecessary, joint maintenance is banished.

Long welded rails are not an untried experiment. For several years, in Germany and Australia, the welding of four or five standard length rails into one continuous rail has been the established practice. In America, welded rails in long lengths have been giving satisfactory service for the past year and a half. No trouble from expansion or contraction has developed on any of this welded track.

Thermit Pressure Rail Welding provides a weld as strong as the rail itself. This weld can be installed by your own track forces at a cost comparable with that of an ordinary rail joint. It will pay you to investigate. Let us send you the complete story of Thermit Rail Welding.

THERMIT Rail WELDING

METAL & THERMIT CORPORATION • 120 BROADWAY, NEW YORK

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No. 84 of a series

Railway
Engineering and Maintenance

SIMMONS-BOARDMAN PUBLISHING COMPANY

105 WEST ADAMS ST.
CHICAGO, ILL.

Subject: NEW DEVICES

November 28, 1935

Dear Reader:

"Among the many devices that are being introduced today for use by the railways we expect you to sift out those that have been tested sufficiently to demonstrate merit and are available commercially. I am prompted to make this statement by an experience which we have just had in following up a description of a likely looking device that appeared in another paper, only to find that the device had not progressed beyond the model stage and that the promoter was interested only in the sale of his patent. Such a description was premature. It wasted our time and created an adverse reaction in our minds against that device—and the publication as well."

So spoke the chief maintenance officer of one of our largest railways to me. The concise expression of his viewpoint has caused me to review our own practices. You may be interested in them.

We receive hundreds of requests to publish descriptions of materials and equipment designed for your use. Some come from inventors whose only objective is to sell their patents. Others come from manufacturers who may be experienced in other fields but are without knowledge of railway problems and desire to use our columns to test out the interest in their device. Still others come from established railway supply companies, accompanied by records of extended tests that demonstrate practicability. To the first two, our columns are closed. With the latter, we are happy to co-operate.

In our endeavor to serve you best, we ask that a promoter of a device be able to demonstrate:

(a) That his device meets a need, as demonstrated by the willingness of some road of standing to make a trial installation.

(b) That the device or material has been developed sufficiently to get most of the "bugs" out of it, as shown by tests under conditions of actual service.

(c) That arrangements have been perfected with a reputable company for its production, so that, if interested, you can secure quotations and delivery.

Through these measures we endeavor to conserve your time and direct your attention to devices and materials that indicate some degree of merit. This is another of the services that we endeavor to render you. Do you find it of value? Have you any suggestions to offer for its improvement?

Yours sincerely,

Elmer T. Howson

ETH:JC Editor

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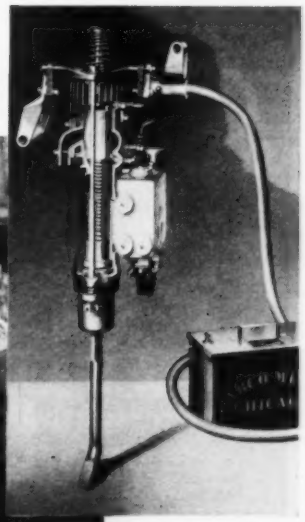
BARCO TYTAMPERS

WORK WELL WITH ANY SYSTEM OF TAMPING OR TRACK MAINTENANCE . . . .



Barco Tytampers, because of their power and ease of handling, will drive the ballast under the ties with sufficient force to bring the rails and joints up to the proper level. And it isn't necessary for the operator to bear down on the tamper—there is sufficient power even for cemented or tight ballast.

Not only do Barco Tytampers speed up maintenance by eliminating time consuming operations, they reduce costs substantially per foot of track tamped because they save in labor requirements and operate at a cost of 15 cents per hour or less.

Each Barco tamper is a complete self-contained unit. It requires only one man to handle. It may be used singly or in units of 2, 4, 8, 12, 20 or more without requiring any cumbersome accessory equipment to be transported.

No tytamper offers greater opportunities for immediate savings in first cost and future economies in maintenance than the Barco.

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TYTAMPERS

Railway Engineering and Maintenance

NAME REGISTERED U. S. PATENT OFFICE

December, 1935

Published on the last Thursday preceding the month of issue by the

SIMMONS-BOARDMAN PUBLISHING COMPANY

105 West Adams Street, Chicago

NEW YORK
30 Church Street

CLEVELAND
Terminal Tower

WASHINGTON, D. C.
932 National Press Bldg.

SAN FRANCISCO
55 New Montgomery Street

Samuel O. Dunn, *Chairman of the Board;* Henry Lee, *President;* Lucius B. Sherman, *Vice-President;* Cecil R. Mills, *Vice-President;* Roy V. Wright, *Vice-President* and *Secretary;* Frederick H. Thompson, *Vice-President;* Elmer T. Howson, *Vice-President;* F. C. Koch, *Vice-President;* John T. DeMott, *Treasurer.*

Subscription price in the United States and Possessions, 1 year, $2.00, 2 years $3.00; Canada, including duty, 1 year, $2.50, 2 years, $4.00; foreign countries, 1 year, $3.00, 2 years, $5.00. Single copies, 35 cents each.

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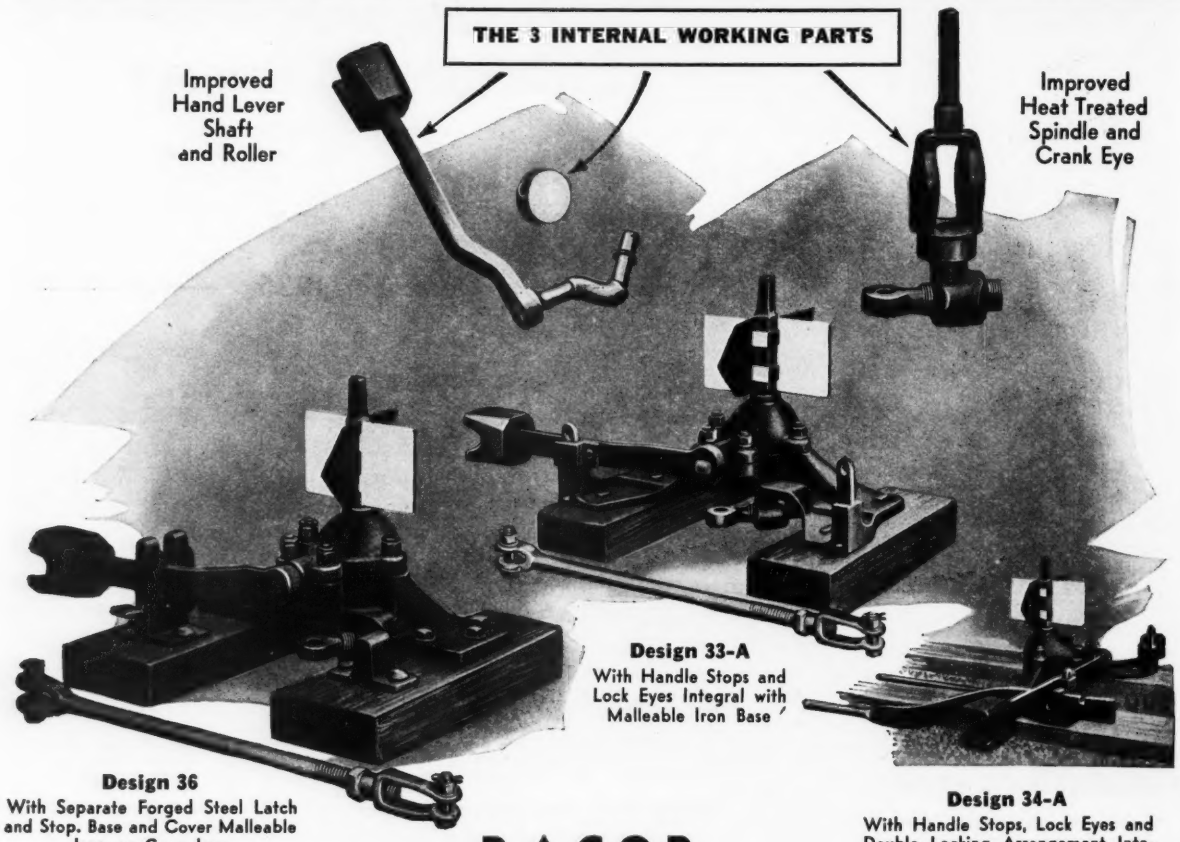

RACOR

PARALLEL THROW GEARLESS SWITCH STANDS

Designs 33-A, 34-A and 36

FEATURES–

The three designs illustrated have identical internal working parts, which are but three in number, namely—the heat treated spindle, the shaft with its operating handle, and the roller. Target may be omitted and lamp tip adapter applied directly above housing for use with target disc lamp. Latches are unnecessary, unless it is desired to lock the stand, as the mechanism is at dead center when the hand lever is down. These designs are especially recommended where it is anticipated switches will not be trailed through when set wrong.

ECONOMY–

Extra large area for wearing surfaces, three internal moving parts, of heat treated steel, and positive and easy operation, definitely establish these low-cost stands as the most economical non-automatic designs now on the market.

SAFETY–

These improved stands have been designed with parts to withstand any stresses under heaviest normal operating requirements.

EXTENT OF USE–

Many of the leading railroad systems have adopted these improved stands for general use.

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Railway Engineering and Maintenance

Waterways

Of Concern to Every Railway Employee

EVERY employee of a railway is vitally interested in the waterway policy of our government. It affects him in two ways: (1) As a taxpayer, directly or indirectly, who must share with every other citizen the cost of constructing and maintaining these channels, and (2) as one who sees his security of employment menaced by the inroads of an uneconomic and subsidized form of competition. This problem is particularly acute now because of the unprecedentedly large sums that are being expended for the canalization of heretofore unnavigable inland streams and the even larger expenditures that are being proposed for a wide variety of still more fantastic schemes of every description.

Many Projects Being Proposed

Among the major projects into which public funds are being poured with apparent abandon today are the Upper Mississippi river between St. Louis and St. Paul, from which traffic has long since all but disappeared; the Missouri river between St. Louis and Kansas City, on which a semblance of barge service has recently been announced and on which canalization is further proposed to Omaha and Sioux City, with the mammoth reservoir project at Ft. Peck, Mont., to maintain a low water flow sufficient for navigation. And these are merely the forerunners of a host of other projects that are being projected, such as a canal to connect the Ohio river below Pittsburgh with Youngstown, Ohio, and Lake Erie; the canalization of the Trinity river to give Dallas, Tex., and Ft. Worth, a waterway outlet to the Gulf of Mexico; the deepening of the Big Sandy river below Kenova, W. Va., to provide a water outlet for coal, etc. In all of these instances there are already rail facilities more than adequate to handle all of the traffic that may be offered. None of these proposals is supported by traffic and earnings figures that will stand investigation.

Nor is the first cost the only cost, for after these waterways are once constructed, it has been the universal experience that large expenditures are made for their maintenance year after year, even though the traffic declines almost to the vanishing point. Like a governmental bureau, once established, it is next to impossible to close a waterway that has been declared navigable.

That this tax is of no small proportions is shown by the costs accruing on the Ohio river where canalization was completed a few years ago. On this stream the traffic is markedly heavier than on most inland streams by reason of the volume of steel products and coal moving down the river from Pittsburgh. Yet figures prepared by a representative of the government for submission to a committee of the United States Senate recently show that the public is subsidizing every ton of freight moving on this stream to the extent of five mills per mile. This means that for every ton of freight transported the 980 miles from Pittsburgh to Cairo, the public contributes $4.90 to the cost of its transportation. And this contribution is relatively heavier on the Upper Mississippi, the Missouri and the smaller streams with their smaller volume of traffic.

What Are the Benefits

In view of the magnitude and continuing character of these drains on public funds, it is pertinent to inquire as to the benefits that are secured. In this quest, major emphasis is placed by waterway advocates on the advantages accruing to the farmers of the Middle West by reason of the higher prices that they will receive because of the lower cost of transporting their grains to the markets of the world. But do the facts support this contention?

A government-operated barge line, which has itself drawn on the taxpayers to make good the deficits in its direct operating expenses, has been in operation on the Lower Mississippi river (below St. Louis) for more than 10 years. Yet in this period, the prices of farm products in the Middle West have been so low as to call for the most revolutionary measures of farm relief. More specifically, and highly illuminating in this direction, is a statement made by Harry A. Volz, head of a large grain and elevator company at Louisville, Ky., while testifying recently before the Senate Committee on Interstate Commerce. In reply to a question from Senator Wheeler, inquiring whether the lower barge line rates were not beneficial to the general public, Mr. Volz replied in part as follows: "Mr. Chairman, that sounds all right to the fellow who is not in the grain business. But, practically speaking, the cities that enjoy these special rates do not pay the farmer any more for his grain. There has been no appreciable difference in the price of grain to the farmer due to the large line rate. Any saving in transportation is absorbed by someone handling it."

Similarly, the builder in the Lower Mississippi valley who buys steel from Pittsburgh, pays the Pittsburgh

price, plus the established rail rate, and any savings in transportation charges effected through the use of the Ohio-Mississippi river waterways, including the five mills per ton per mile paid by the taxpayers, accrues to the producers—at least they are not passed on to the consumer. A similar analysis can be made of practically every commodity that is diverted from the railways to water transportation.

When the Railway Is Gone

Another phase of the ultimate in waterway development is the situation now confronting the city of Key West, Fla., following the hurricane last September which destroyed the Florida East Coast Railway's line into that city from Miami. Key West has a good harbor and has long been served by numerous water lines. Prior to the storm, there were in that community, as in other communities, persons who were inclined to be antagonistic to the railways and to favor the water lines. Now that the railway has been destroyed and its reconstruction is in doubt, it is interesting to note how these opinions have changed.

Key West still has its harbor. It is still served by the water lines, but the city is faced with economic ruin, for much of its business cannot continue without the fast, dependable and regular transportation service that is provided only by rail. A survey conducted by the Miami, Fla., Herald, shows, among other things, that the loss of rail transportation will deprive Key West of payrolls, direct and indirect, totaling $1,000,000 annually; will cause the county and city to lose $100,000 annually in taxes; and threatens losses to business sufficient to bring about a 60 per cent decrease in population. The loss of this railway has become a major calamity for Key West, and this is more than a possibility for other cities whose traffic is being diverted to the waterways.

Many communities are today losing their rail service through the abandonment of lines. Every shipment that is diverted to a waterway brings this crisis nearer to some city. It is time for the public to face this situation squarely. It is the responsibility of railway employees to see that they are acquainted with the facts.

Terminals

How Large Should the Sections Be?

IN a report presented at the convention of the Roadmasters and Maintenance of Way Association in September, a committee expressed the opinion that the most efficient maintenance organization for terminals involves larger sections and fewer foremen than were common a few years ago. As with most proposals that have been advanced in recent years advocating changes in the maintenance organization, this one was greeted with considerable opposition. It appeared, however, that a large majority of those present were in agreement with the report; and they presented considerable evidence in support of their stand.

The desirability of fewer sections in terminals, it was pointed out, has been brought about in large measure by the widespread introduction of mechanical equipment and the increased weight of rail and other track material. Mechanical equipment is not only more efficiently and economically handled by larger gangs, but its use by large floating or extra gangs in such operations as the out-of-face renewal of ties and rail has left the regular section forces free to devote all their time to routine maintenance tasks. Also, the trend toward heavier materials has made desirable gangs of sufficient size to handle these materials without "doubling up" adjacent gangs. Another factor that has contributed to the desirability of larger sections is the necessity for obtaining the maximum amount of productive labor from present reduced maintenance allowances.

The discussion of this subject illustrates the fact that railroad maintenance men must constantly be on their guard against what seems to be a natural inclination to oppose, without thorough consideration of the facts involved, any proposal that involves a change from the established order of things.

Snow Storms

A Free Hand Is Essential

ESPECIALLY in recent years, with their drastically reduced expenditures, the annual battle struggle of most roads in the northern part of the country with severe snow storms has become particularly serious as these storms have made inroads on funds so sorely needed for more constructive work. Maintenance of way men have not yet found a way to prevent severe snow storms, but they do know how and are willing to fight them, even under great handicaps.

The odds are always against the railways during severe snow storms, and they have been increasingly so during recent years on some roads. While the speeds of trains, both freight and passenger, have been stepped up almost universally, and while the public is again becoming passenger train conscious, maintenance of way forces, greatly reduced in size, are called upon to do an increasingly thorough and effective job, in many cases without the mechanical aids which they know are essential under the circumstances.

Most maintenance of way men in territories subject to severe snow storms know that there are two essentials to fighting such storms effectively and economically. The first of these is to prepare adequately well in advance of winter,—that is, to organize their forces, to prepare their equipment, and to improve their track and roadbed drainage wherever necessary, and the second is to direct the energy of their entire organization against a storm before it gains headway or gets entirely out of control.

Few roads, conscious of the troubles which may result from failure in either of these respects, are foolhardy enough to overlook detailed advance preparation, although some roads go to greater lengths than others in anticipating the urgent demands of storm conditions. However, in some cases, maintenance of way forces are expected to do a perfect job while insufficiently equipped with the necessary modern mechanical aids, and are in-

fluenced beyond their best judgment as to when to tackle a storm, with the hope that it may be less severe than expected and that delay may result in economy. Unfortunately, these two factors have played an important part in recent years in the delaying of trains and, in more than one case, in the disruption of traffic, with direct costs far in excess of what they might have been, not to other than mention the losses in traffic and patron goodwill.

The maintenance of way department, as the one bearing the major responsibility for keeping the railways open under all snow storm conditions which may be expected, should leave no stone unturned at this season to prepare to meet these conditions; it should press its requirements for further snow-fighting and snow-melting equipment and devices where the need is vital; and it should resist any influence or temptation to act contrary to its best judgment as to when to go into action against storms. To do otherwise is to put the department on the "spot", and, of greater importance, is to permit the possible development of a situation costly and in every other way detrimental to the best interests of the railroad as well as of its patrons.

Track Patrol

Changing Conditions Bring New Practices

PROBABLY no maintenance officer will dispute the necessity for regular and organized track inspection. At this point, however, agreement ceases, for the frequency and methods, as well as the personnel, of inspection differ widely. The system of trackwalkers which was in vogue for many years, and still persists on not a few roads today, grew out of the weaker track structure of the early railways. As experience accumulated and better materials were developed, the track became stronger but still remained inadequate for the loads imposed upon it, for wheel loads and train speeds increased more rapidly than the track gained in strength.

Of late years, the track has caught up with the locomotive and on not a few roads has passed it, for which reason the number of defects discovered by trackwalkers has decreased to such an extent that inspection has sometimes become perfunctory. In recent years, better materials and new methods of conserving those in service have led to partial or complete reorganization of the gangs engaged in track maintenance. As a result, the old system of track patrol, which absorbed five per cent or less of the cost of section labor, may now run as high as 40 per cent.

These are only a few of the many changes in maintenance practices which have pointed of late to the desirability of revising the method of track patrol. As one road after another has reorganized its track forces, it has also directed its attention to devising a method for track inspection which will fit in with the new organization, make the inspection more positive and, at the same time, reduce the ratio of patrol time to total time worked. Formerly, it was the universal practice to make the foreman responsible for the regular inspection in his own section. Under the new order this conception is changing, and in numerous recent instances the foreman has been relieved of routine inspection and retains responsibility for patrolling the track only during storms, floods or other emergencies.

The most recent instance of a revision of the track organization is that of the New Haven, which has abolished the local section gang and is maintaining its tracks with mobile gangs having no fixed territorial limits. It is obvious that under such a system an entirely new practice of patrolling the track and of reporting and repairing defects has been necessary. Other roads have reorganized their track forces along more conventional lines, although they have broken away from convention in their methods of track inspection, and have found both to be successful. There is no reason to believe that the New Haven's plan will be less successful, but because of the radical departure which it embodies, it will be watched with unusual interest by maintenance officers.

Solidification

More Attention in Construction Work

CONSTRUCTION work in recent years has been characterized by an increasing attention to those practices in grading that will consolidate or accelerate the consolidation of embankments, and thus obviate "extraordinary" maintenance during the initial years of operation. Among the measures employed are the placing of the fill in layers by means of trucks or crawler-mounted equipment, the use of rollers, and the wetting of the fill material as it is placed. In some cases, also, material known to be unstable is wasted as it is removed from the cut, and more suitable material is taken from borrow pits, in spite of the greater expense that such double-handling involves. Similar precautions are now taken more frequently to avoid trouble in cuts. More attention is being given to insure smooth cut slopes and in some instances the slopes are sodded to preclude washing.

While the amount of construction work now in progress is small, when considered from the standpoint of the number of miles of line affected, the current program of grade separation will result in the disturbance of the roadbed in many locations. Therefore, unless pains are taken in restoring the roadbed when these projects are completed a large number of rough spots will result.

On the whole, these projects are designed with scrupulous care. Special attention is given to drainage behind the abutments, but in not all cases is particular thought given to the material used in backfilling or to the manner of its placing. On the other hand, railway officers who have insisted on the use of porous, quickly-compacting backfilling material have met with opposition from the state authorities on the ground that such refinements involve a wasteful use of public funds. Maintenance officers owe it to themselves to stress the importance of a thorough job in the building of roadbeds, and they should not find it difficult to find demonstrations of the savings in upkeep that accrue from the application of effective means of solidifying embankments during construction.

Eliminating The Section Gang

This article describes the reorganization of track forces put in effect on the New Haven during the last summer, which substitutes heavy-work and spotting gangs, with large indefinite territories, for section and extra gangs. The new arrangement, which calls for the extensive use of highway motor trucks to transport men and materials, has eliminated 154 gangs, has reduced the cost of supervision and work-train expense, and gives indications of largely increased production.

DURING the last summer the New York, New Haven & Hartford completely reorganized its track maintenance forces in a way that not only recognizes the trend toward specialized gangs for out-of-face work, and smaller section gangs, but that goes beyond present advanced practice in several respects, one of the most important of which is the complete elimination of track sections and section gangs. In their place the road has adopted what may be described as permanent, fully-equipped, motorized floating gangs, which carry out all out-of-face and major emergency maintenance operations under the immediate direction of the track supervisors, supplemented by what are termed "spotting" gangs, which are similar to the former section gangs only in certain respects.

Large Economies Expected

The most unusual feature of the new organization is the fact that while both types of gangs have permanent headquarters, and work generally within defined limits, they have no rigidly fixed territories for which they are definitely responsible, and are shifted about and worked at the discretion of the supervisors in accordance with prearranged work schedules or programs, unless interrupted for emergency work. Another unusual feature of the organization is the further fact that each of the larger gangs, of which there are 51 on the road, is equipped with a three-ton highway motor truck, as well as with one or more track motor cars. Through the use of the trucks, the minimum of time is required in getting the men, tools and materials to and from the site of work; losses of thousands of man-hours due to train interferences have been eliminated, and work train service and expense have been decreased materially.

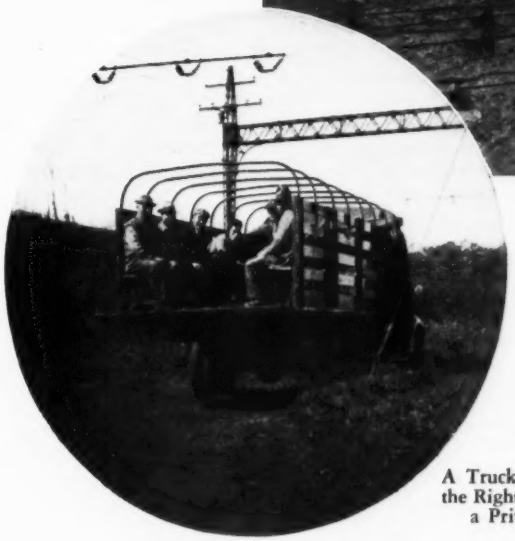
Through the new organization, a saving of approximately $130,000 a year in maintenance of way operations is expected, after taking into account all increased costs such as those attendant on the operation, maintenance and depreciation of the new motor trucks. The major economies in the new organization, which have already demonstrated themselves conclusively, are effected through reduced cost of supervision, minimized work-train expense, more efficient work organizations, and reduced non-productive time of the men. No sizable reduction in labor force is contemplated as a result of the reorganization, although somewhat reduced forces have been employed since the new organization was put into effect, and no fundamental changes were made in former large-gang organization methods of doing work, such as surfacing track, renewing ties, laying rail, ballasting and similar operations.

Old Sections Gone

The former organization of track forces on the New Haven was not unlike that on most other roads, including as it did, section gangs, with specific territories, for doing routine work, and extra and work-train gangs for carrying out most of the heavy or out-of-face operations. Under this arrangement, outside of the four-track territory between New York City and New Haven, Conn., there were 258 section and yard gangs, 19 extra gangs and 15 work-train gangs on the road. The section and yard gangs included 5 to 10 men during the winter months and 8 to 20 men during the summer months, the individual section gangs being responsible generally for the maintenance of approximately 10 miles of track. The extra and work-train gangs, without specifically assigned territories, usually included from 10 to 25 men.

A 16-Tool Electric Tie Tamping Outfit Being Operated on the Main Line by One of the New Mobile Heavy-Work Track Gangs

One of the 51 Heavy-Work Gangs, With a 16-Tool Pneumatic Tie Tamping Outfit, Surfacing Track on the Springfield Division



A Truck Approaching the Right of Way Over a Private Drive

The foregoing leaves out of consideration the 69 miles of four-track electrified territory between New York City and New Haven, which, since 1933, has been maintained by special maintenance gangs more or less similar to those in the new organization which have been adopted for the road as a whole. As a matter of fact, it was largely upon the experience and results on the New York territory that the force change was extended over the entire system. However, because of the special problems and conditions which exist in the four-track electrified territory, which are not applicable to the remainder of the road, the discussion in this article has reference only to the lines beyond Devon, Conn., about 12 miles west of New Haven, for which readily comparable data are available.

154 Gangs Eliminated

Under the new arrangement, which was put into effect on June 1 of this year, there are a total of 138 track gangs, which include 51 large, heavy-work gangs, 58 spotting gangs and 29 yard gangs. This compares with the total of 292 gangs formerly, a reduction of 154 gangs. It was not a primary purpose of the reorganization to reduce the number of men employed, although due to causes largely irrelevant to the reorganization, the number of track laborers employed during the last summer has been reduced approximately 30 per cent from that of the summer of 1934, to approximately 1800 men, and it is expected that a normal basic winter force under the new arrangement will include approximately 1600 men.

One of the important reductions in costs through the reorganized track forces is in supervision. Whereas the former organization included 258 section foremen, 19 extra-gang foremen, 15 work-train foremen and 46 assistant foremen, a total of 338, the new organization includes 142 foremen and 80 assistant foremen, a total of 222 men. This represents a reduction of approximately 34 per cent in the supervisory force, and, in spite of the payment to the 51 new large-gang foremen of a higher rate than the former section foremen received, and the increase in the number of assistant foremen, a pay-roll saving of approximately 41 per cent has been effected in the cost of supervision.

No disadvantage has developed or is expected as a result of this reduced supervision, since it was long felt that the former arrangement was providing increasingly excessive supervision as the size of the gangs was reduced. Furthermore, the gangs, under the new arrangement, are in charge of the most alert and experienced former foremen, and where the character of the work of the larger gangs requires, these gangs have one or more assistant foremen as needed.

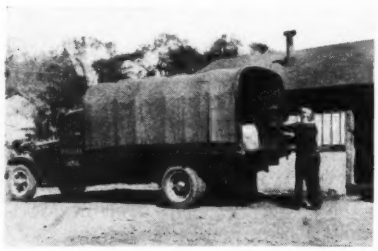
No Definite Territories

In the new arrangement, the larger gangs, which include normally from 10 to 15 men, have headquarters generally from 25 to 40 miles apart, and, while their limits of movement and operation are generally restricted, these limits are not rigid in that the track supervisors can use the different gangs anywhere at will, either singly or together, as may seem best in the interest of efficiency or economy. Thus, the spacing of the headquarters of the larger gangs along any section of main or branch line indicates only in a general way the scope or extent of their activity.

This is evidenced clearly by the fact that the single-track mileage covered by the different gangs ranges from as little as 40 miles to as much as 80 or 90 miles, and by the further fact that the trackage worked by any particular gang is not necessarily continuous. As a matter of fact, many of the large mobile gangs are worked normally on several sections of line, easily jumping across country to radiating branch lines to carry out work on sections of track otherwise remote by rail from their headquarters. For example, the truck gang with headquarters at Middletown, Conn., operates on five different lines out of that point, while the gang at Pine Plains, Conn., reaches out normally

over five or six branches in different directions. In many cases, sections of track worked by the gangs have no direct rail connection with the headquarters of the gangs.

These large and seemingly disconnected territories of the different gangs are possible, of course, only through the use of the highway motor trucks furnished the gangs, combined with the relative compactness of the New Haven system and the intensive network of state and county highways throughout the



One of the New Canopy-Top Trucks, Which Has Just Transported Men and Tools to the Site of the Day's Operations

territory served by the road. These factors will be discussed in more detail later.

The work of the larger gangs includes all of the heavier and out-of-face maintenance operations, such as track lining and surfacing, general tie renewals, rail laying, ditching, general right-of-way mowing, ballast cleaning, out-of-face bolt tightening, and such operations as distributing, spreading and dressing ballast. For some of these operations two or more gangs are bunched, traveling to and from their individual headquarters daily, while in certain cases single gangs are enlarged temporarily to meet the requirements for manpower for efficient organizations.

Distribution of Gangs

The 58 spotting gangs on the road, which include from 4 to 6 men and a foreman, are scattered over the system more or less uniformly with respect to the larger heavy-work gangs, one spotting gang usually being assigned to the territory worked normally by each of the larger gangs, although in a few cases there are two spotting gangs on large-gang territories, and in certain other cases the territories of the smaller gangs have no direct relation to those of the larger gangs.

The accompanying line and gang headquarters diagram shows how the larger and smaller gangs are quite generally alternated over the railroad, and the very few cases where the gangs have headquarters at the same points. The purpose behind this spacing of gangs was, of course, to minimize unproductive travel time so far as possible, and to have forces well distributed to meet the demand of emergency work most expeditiously.

Spotting Gangs

The spotting gangs, as the name implies, are routine light maintenance gangs, whose work supplements the heavier out-of-face operations of the larger gangs. With territories comparable in size generally to those of the larger gangs, although, more frequently than not, not the same territories in full as any of the adjacent large gangs, these light gangs confine their operations to spot surfacing, spot joint maintenance work, policing, and emergency repairs or renewals.

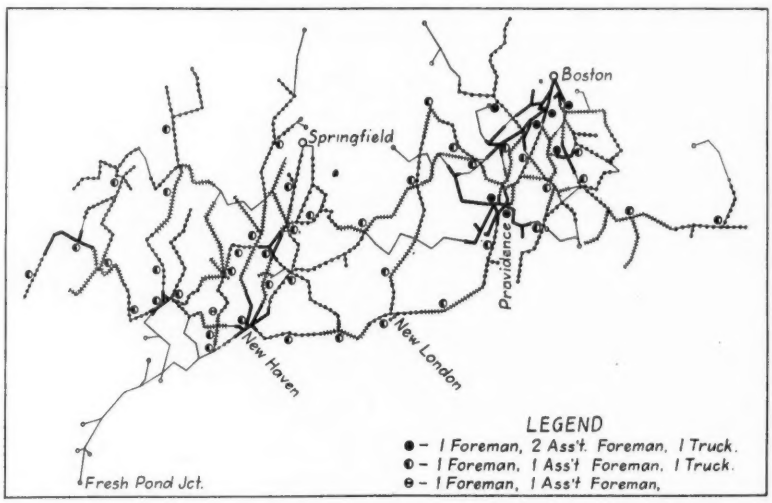
While these light gangs may be worked at any points designated by the track supervisors, it is planned that they shall normally be worked on those sections of track which will not be worked over that year by the larger gangs. The plan to which the New Haven is working calls for working the larger gangs over one-fourth to one-third of the railroad each year, putting that much trackage in first class shape, and relying upon the spotting gangs to maintain the remainder of the trackage not touched by the larger gangs. Under this arrangement, with its complete segregation of heavy and light maintenance operations, it is felt that the heavy work will be carried out more effectively and economically, and, at the same time, that the remaining trackage not included in a year's heavy-work program, will be adequately maintained.

Yard maintenance, except in the smallest yards, is handled by the 29 yard gangs in the new organization. These gangs, with 6 to 20 men each, including the foremen, confine their attention to yard trackage and general yard maintenance work, except in a few cases where the size of a yard does not, in itself, justify a gang of the size necessary to carry on all classes of work. In these cases, rather than reduce the efficiency of the gang by cutting it down in size, its jurisdiction, as a spotting gang, has been extended out on main or branch line track.

Trackwalkers Abolished

Under the new organization, section trackwalkers have been abolished and the duty of daily track inspection has been assigned in large measure to track and motor patrols. Under this revised system of track inspection, details of which will be given in an article to appear in a subsequent issue, there are 12 track (foot) patrols and 40 motor car patrols on the road, which report directly to the track supervisors.

As already pointed out, the very essence of the reorganized track forces on the New Haven, and, more particularly, of the heavy-work gangs, with their large and often spread-out territories, is the employment of highway motor trucks to transport men and materials quickly to and from points of work. Recognizing this, concurrent with putting the new organization of forces into effect, the road purchased 51 new



Sketch Map of the New Haven, Showing the Radius of Operation of the New Truck-Equipped Gangs

motor trucks, assigning one to each of the heavy-work gangs. These trucks, which supplemented 49 trucks already in use by maintenance of way forces, particularly in connection with bridge and building and water service work, are of two general types, one type having a fixed canopy top with roll side curtains, and the other having a stake body with removable side racks, top

served by the railroad, with many of the roads paralleling the tracks or providing access to the right-of-way at many points, adapts the trucks for the direct transportation of men and materials. With the trucks, the travel speed is invariably faster than that of the heavily loaded track motor car; the route by highway, taking advantage of cross-country roads, may be materially shorter

distributing materials, the motor car, with an operator and two helpers, starts out from the gang headquarters sufficiently in advance of the truck gang, taking into consideration possible delays due to train movements, to be at the point of truck contact by the time the truck arrives. Thus, at small expense, the motor car, and trailer if necessary, is available on the job, to transport

Form 1214

DAILY REPORT—AUTOMOBILE TRUCK

New Haven Division Mtce. Dept. Sept. 20, 1935 Date

Truck No. G-65 Reg. No. Conn. 484

Headquarters New Haven

Driver D. Carrolo

Time reported 5.30 A.M.

Time relieved 3.30 P.M.

Speedometer reading start of day 4610

Speedometer reading finish of day 4681

Gallons of gasoline put in 8

Quarts of oil put in 0

Repairs None

FROM Place	FROM Time	TO Place	TO Time	Approx. Miles	CARRIED No. Men	CARRIED Tons, Material	DELAYS	NATURE OF WORK (Show if AFE or C. & D.)
New Haven	5.30	Milford	6.00	10	16	None	None	Took tamping gang to work
Milford	6.00	New Haven	6.30	10	0	"	"	Return trip
New Haven	6.30	Belle Dock	6.50	3	1	"	"	To load material
Belle Dock	7.20	Ansonia	8.00	16	1	½ ton	"	Carrying material for crossing repairs
Ansonia	8.00		10.30	-	-	-	-	Assisting in crossing and driveway repairs
Ansonia	10.30	New Haven	11.00	12	1	None	None	Return trip
New Haven	11.30	Milford	12.00	10	0	½ ton	"	Delivering material
Milford	12.00		2.30	-	-	-	-	Working with tamping gang
Milford	2.30	New Haven	3.30	10	16	None	None	Brought gang home

The Daily Truck Report, Which Shows that Truck G-65 Covered 71 Miles on September 20, Indicates the Varied Movements of the Trucks in Performing Their Daily Functions

bows and tarpaulin. Thirty-five of the trucks have 15-ft. bodies, while the remainder have 12-ft. bodies.

All of the trucks have a capacity of 6,000 lb., and are fitted with longitudinal side seats. These are either removable or hinged so that the full platform width of the body can be used for trucking tools, materials or supplies when not transporting the men. In addition, the larger trucks are fitted with a removable longitudinal center seat so that their normal seating capacity of 16 can be increased to 24.

Motor Cars Still Used

In addition to the motor trucks, each of the 51 large gangs has one or more track motor cars and trailers, which are used frequently to supplement the motor trucks, particularly where the lack of roads makes it impossible for the trucks to come within close range of the scene of operations. However, the network of main, secondary and private roads throughout the territory

than by rail; and all delays due to train operation are eliminated. This latter factor is particularly important in connection with the movement of large gangs on the new Haven, since, because of frequent train service, there has been a rule of long standing on this road that motor car movements can be made only after the permission of the dispatcher has been obtained.

Travel Time Reduced

Under the old arrangement, when motor cars were used exclusively to transport the men, delays of 15 min. to 2 hours to entire gangs were not uncommon in getting to or from work, and similar delays occurred frequently at other times in moving tools and materials. Under the new arrangement, the men and equipment are moved almost invariably by motor truck. If the site of the work is some distance from the nearest point of contact of the truck with the railroad, or if a motor car is needed on the job for handling or

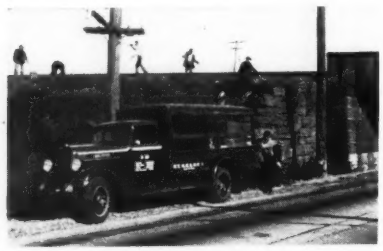
the men further along the line, or to be used as an auxiliary to the work.

If the work is a continuation of earlier work, the tools will already be on the ground locked in tool boxes. On the other hand, if it is a new site of operations, the tool boxes are brought out the night before or on an earlier truck trip in the morning. If conditions necessitate, when moving a gang from one location to another, two or more trucks may be brought together to make the move most expeditiously. In any event, the trucks are used early or late, or singly or together, as seems best to minimize the nonproductive time of the gangs. If there are materials or supplies to be handled during the day, the trucks are used for this purpose, or they may be used in other services or by gangs other than their own requiring more than one truck temporarily, returning to their own gangs in the evening in time to carry the men back to headquarters.

The operators of the trucks are

rated as maintenance helpers, with a rate of pay slightly above that of the trackmen. When not actually driving the trucks or working on or about them, these men assume the duties of the rest of the men in the gangs and engage in whatever track work is being done.

The extent of the use of the trucks in transporting men and materials is evidenced clearly in the operating reports, which show daily operated



One of the Removable Rack-Side, Tarpaulin-Top Trucks Engaged in Distributin Track Materials During the Day While its Gang is at Work Some Distance Away

mileages ranging from 20 to as much as 180 miles. These larger mileages are not due to long hauls, but rather are the summation of several shorter trips which keep the trucks busy during the day.

The most apparent economy effected through the use of the trucks is in the handling of materials, the use of the trucks for this purpose having reduced materially the need for work-train service. As a matter of fact, through the use of the motor trucks, it is expected to decrease yearly work-train expense approximately $37,500, this estimate taking into account the cost of operating and maintaining the trucks, figured at 10 cents a mile, and depreciation charges based on replacement in five years.

There will continue to be some expense for the operation and maintenance of motor cars, but through the reduced mileage of these units, this will be largely reduced. At the same time, as a direct result of the reorganization of forces, 85 motor cars were retired from service.

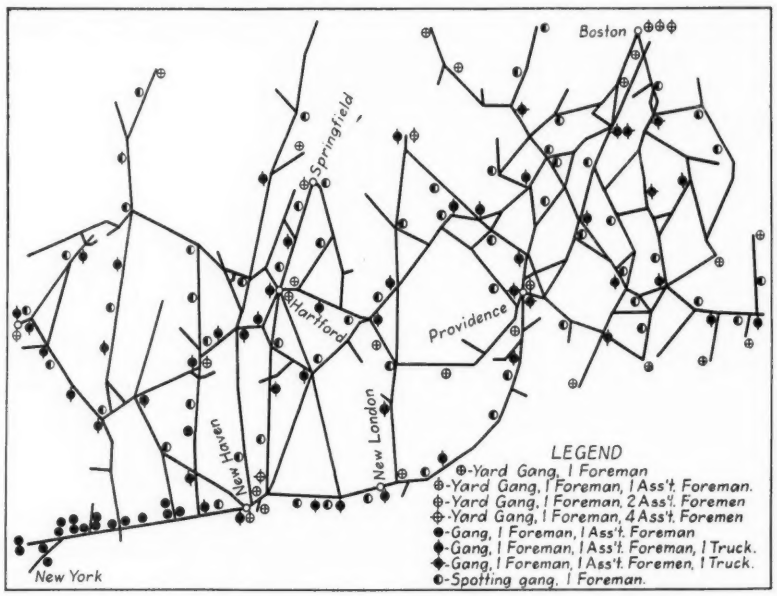
All of the spotting gangs, except those located in electrified territory, are equipped, as were the former section gangs, with motor cars for their routine movements. However, there is nothing to prevent the track supervisors from giving truck service to these smaller gangs temporarily when the trucks are idle or are not engaged in more important work with the larger gangs.

Recognizing that adequate maintenance of the trucks is essential to their effective and economical operation, a thorough arrangement has been set up in this regard. The drivers are required to take care of routine greasing and oiling work, and are responsible generally for the condition of their trucks. Lubricants, as well as gasoline, are secured from either the service stations of the Connecticut Company or the New England Transportation Company, bus line subsidiaries of the railroad, or from private service stations under contract.

After each successive 2,000 miles of operation, the trucks are given a general inspection by the work equipment forces of the maintenance of way department, and after each 8,000 miles of operation, they are run into the service stations of the company subsidiary bus lines for detailed inspection, oiling and cleaning. At the end of each 24,000 miles of operation, the trucks are completely overhauled at one of the service station repair shops.

To guard against oversight in the regular periodic inspection, greasing and shopping of the trucks, the checking of running mileage limits was put in the hands of the statistical department of the road. This department, which receives and compiles the daily mileage figures of each of the trucks, notifies the track supervisors promptly when each of their trucks must receive one of the three classes of attention—a general inspection, a detailed inspection, or overhauling. Through this arrangement, which is supplemented by a comprehensive set of rules for the operation of the trucks, it is felt that maximum service will be secured from them, at minimum overall cost.

Prior to the reorganization of forces on the New Haven, most of the heavier out-of-face maintenance operations had been carefully organized and fully mechanized, and were carried out by either extra gangs or bunched section gangs, so that the new force organization, with its sizable permanent heavy-work gangs, did not contemplate any important changes in methods of carrying out different classes of work. For example, track surfacing will continue to be done with the 8-, 12-, and 16-tool pneumatic and electric tie tamping outfits that were already on the road, and such work as rail laying, ballast cleaning, ditching, etc., will continue to be done largely with power equipment.



Straight-Line Map of the New Haven System, Showing the Headquarters of the Various Types of Maintenance-of-Way Gangs

It is true, however, that the new organization, with its larger number of heavy-work gangs, will permit the more extensive use of mechanical equipment, and, it is expected, with largely increased effectiveness and economy.

That this latter expectancy is justified is seen in the fact that, already, the production of the surfacing gangs under the new organization has showed marked improvement. From June 1, when the new organization was put into effect, until November 1, when the major part of the track surfacing work was suspended for the winter, the output per tool in the surfacing

gangs had increased approximately 30 per cent over the output during the same period of 1934. With no fundamental changes in the methods used, this improvement in production is attributed largely to the decrease in the non-productive time of the men in moving to and from work, made possible by the use of the trucks, and to certain refinements in the gang organizations and equipment layout designed to keep the tools in operation as continuously as possible each day.

The effectiveness of the new force organization, and the success with which it will be able to build new strength into a large mileage of tracks yearly, while maintaining the remaining trackage in a uniformly safe and smooth-riding condition, is dependent to a large degree upon the alertness and judgment of the individual track supervisors. With materially fewer foremen through the reduction in the number of gangs, (although no less thorough supervision of specific operations); with definite territories wiped out, the condition of which formerly was the responsibility of individual gangs or foremen; and with the sole responsibility in this regard, plus the daily assignment of all gangs now resting upon his shoulders, it is evident that the track supervisor has become the key to the success of the new organization.

Through his own observations and those of his track or motor patrols, he must know daily the condition of every mile of track under his supervision, and must not only program the work of his large gangs to keep them at maximum production, but must also plan and direct the work of all of his spotting gangs. Furthermore, he must, to a larger extent than before, assume the responsibility for keeping the gangs supplied with the necessary materials, and, whereas he formerly exercised little or no direct jurisdiction over the operation of motor cars, he must now see that his motor trucks are used most effectively, both to minimize the unproductive time of his forces, and to make the use of work trains a last resort measure. Enlarged, as are these responsibilities, the supervisors are meeting them with renewed interest and alertness, and, all along the line, there are indications that the new order of things will accomplish results beyond earlier expectations.

The reorganization of the track forces on the New Haven was planned and carried out under the direction of E. E. Oviatt, chief engineer, and Col. A. L. Bartlett, engineer maintenance of way.

Directors Honor a Roadmaster

THAT a roadmaster occupies a position of responsibility and importance in the supervisory staff of a railroad is commonly appreciated by railway managements. For the board of directors of a large railway to take official recognition of the passing of one of its roadmasters is sufficiently unusual, however, to constitute a tribute of no mean proportions. Such was the testimony paid by the directors of the Chicago & North Western to P. J. McAndrews, roadmaster at Sterling, Ill., who died on July 11. This recognition was embodied in a resolution adopted by the board of directors on September 4, a copy of which was engrossed and presented to Mr. McAndrews' family. We reproduce the first and last pages of the resolution as engrossed, together with a copy of the resolution which reads as follows:

RESOLVED, in view of the notable service record of Patrick J. McAndrews, former roadmaster on the Galena division of this company's railroad, who died July 11, 1935, that the directors of the company hereby express their deep sense of loss of an unusually valuable supervisory officer who served the company with exceptional fidelity and skill throughout a period of nearly forty-six years.

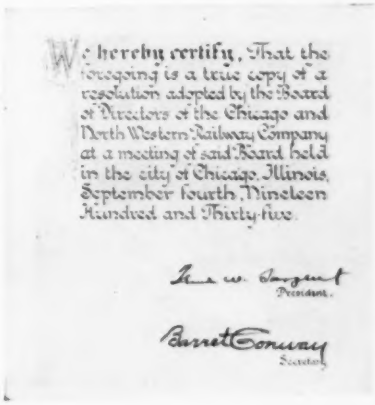
Upon entering the company's employ in October, 1889, in its track maintenance forces, Mr. McAndrews showed marked ability, resourcefulness and thoroughness in his work and rose rapidly through successive positions of leadership and responsibility until, as roadmaster, he had charge of the maintenance and upkeep of one of the busiest and most important subdivisions of the company's railroad. Throughout his entire period of service he not only applied himself unstintingly and wholeheartedly to his immediate tasks and duties, but made a thorough study of maintenance of way work and won recognition by being elected from time to time to various official positions, including the presidency of the Roadmasters and Maintenance of Way Association, later becoming editor of the official magazine of that association.

The quality of his work was known and recognized not only by the company's officials but by railroad maintenance men generally throughout the country. He was frequently called into consultation to give expert advice on stubborn problems of track maintenance outside of his immediate territory.

He was a man of forthright integrity, rugged honesty and unbounded zeal and enthusiasm in the faithful and highly efficient discharge of his responsible task of keeping the portion of railway under his supervision in safe and adequate condition for the uninterrupted flow of traffic. It may be said with truth that the welfare of the North Western Railroad was almost a part of his religion.

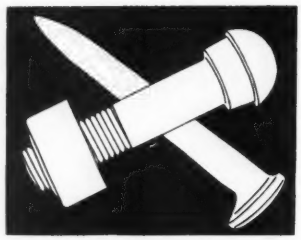
In his home, in his church and in his community, all of which he served with zealous devotion, he was loved, honored and respected. He was an example and an inspiration. His passing is a distinct loss to the Chicago & North Western Railroad Company. It is, therefore,

RESOLVED, that we honor the memory of Patrick J. McAndrews by entering this tribute in the records of this board of directors and order it to be engrossed and presented to his bereaved family with our deepest sympathy.


We hereby certify, That the foregoing is a true copy of a resolution adopted by the Board of Directors of the Chicago and North Western Railway Company at a meeting of said Board, held in the city of Chicago, Illinois, September fourth Nineteen Hundred and Thirty-five.

President.

Secretary.



Standardization

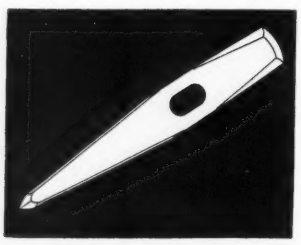
What Can B

IS standardization practical? Can the many problems which rise out of the great diversity of designs for track materials and tools be solved by rigid standardization? If not, what can be done about it? Should the railways sit back and let nature take its course? Or is there some alternate proposal that will be superior to either rigid standardization or the present unrestrained individualism which prevails with respect to many of the materials and tools used in track construction and maintenance? If standardization is practical, is it desirable and should the adoption of standards be made mandatory?

This is the twelfth and last article of a series dealing with the diversity of designs and specifications for track materials and tools. In the first article, in the November, 1934, issue, the general problems of standardization were presented, together with the views of those who favor and those who oppose rigid standardization. In the succeeding 10 articles the facts concerning the numerous and diverse designs for specific materials and tools have been presented. The problems of manufacture which arise by reason of this diversity have been pointed out, and the manner in which they affect the railways has been shown.

No Conclusions

In presenting these views of the proponents and the opponents of rigid standardization, a studied effort was made to be entirely impersonal and to refrain from expressing any opinions or drawing any conclusions of our own. In the same way, the facts concerning the diversity of designs for the various materials and tools under discussion have been presented with only such comments as were necessary to bring the actual conditions surrounding the production and use of these devices clearly before the reader. This was done in the belief that it was not possible to draw sound conclusions until all of the facts were known with respect not only to the diversity of designs, but also to the trends in design. In this the final article of the series, however, *Railway Engineering and Maintenance* will endeavor to answer the questions with which this article begins, which are repeated from the first article of the series, and offer what it believes to be the best solution of these problems.



This is the twelfth and final article of a series dealing with the diversity of designs found in track materials and tools, the first of which appeared in the November, 1934, issue. In these articles, the problems of standardization as applied to rail, rail joints, tie plates, spikes and bolts, wrenches, adzes, sledges, spike mauls, chisels, lining, tamping and claw bars, and picks were discussed in detail and the problems facing the railways and manufacturers by reason of the multiplicity of designs were pointed out. In this concluding article, a practical solution for these problems is presented.

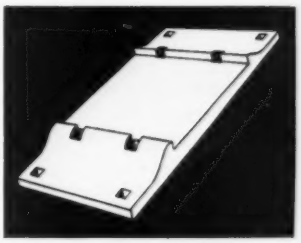
In the articles dealing with specific devices it has been shown that the designs for track materials and tools are so numerous and diverse as to place an unnecessary burden of cost on their manufacture, and that in not a few instances this burden has been greatly increased by reason of a similar diversity in the specifications under which they are made. It has also been shown that there is a justifiable reason for many of the differences, but that no justification can be found for many others. In fact, careful study of the designs for almost any of these devices will disclose no apparent reason for most of the variations. In not a few cases, however, the explanation of why these latter variations have occurred is simple, and this will be discussed later.

Track wrenches and lining bars afford excellent examples of variations in design for which no adequate reason can be discovered. For instance, it was shown in the article on wrenches, in the January issue, that in a limited number of wrenches for two sizes of bolts there were as many as 30 and 36 variations, respectively, in the principal dimensions, and still more numerous variations in unimportant details. It was also shown that some wrenches for small bolts have long handles while others for large bolts have short handles, and that all lengths of handles may be found on wrenches for a single size of bolt. Likewise, 15 different wrenches which were being made in a single plant on the same day for 15 different roads had 15 different designs for the heads.

Astounding Situation

In the April issue, a still more astounding situation was disclosed with respect to lining bars, since a single manufacturer is compelled to make 144 different sizes and shapes of this simplest of all track tools to meet the requirements of his customers. To mention only one detail, differences as small as 1/8 in. were found in the length of the octagonal section of the bars, a variation that is clearly without reason, since variations in this part of the tool do not affect its use.

A similar situation was shown for adzes in the June issue, since differ-



an Be Done About It?

ences as small as 1/16 in. in the length of the blade and of ⅛ in. in its width were found to be common, although blades for this tool range from 5 to 11 in. in length and from 3 to 6 in. in width. Again, although the maximum and minimum dimensions of the eye lie within an extremely small range, there is an almost unbelievable number of designs for the shape and size of this element of the tool. More astonishing yet, it was shown that many of the tools having different designs for the eye are being used with identically the same handle.

More Aggravated

When we turn to track materials we find the same conditions, but in some cases in still more aggravated form. For instance, one manufacturer has been required to apply an average of nine different punchings to every tie-plate section he has rolled during a period of 20 years. Another manufacturer has produced 250 new combinations of tie-plate sections and punchings every year for the last 20 years. Will two tie plates which vary in length by only 1/64 in. differ in their service characteristics by reason of this difference in length? Again, is there any adequate reason why approximately 100 different designs of tie plates are being ordered currently for a single width of rail base? These and many more astonishing facts concerning this relatively simple device were discussed in detail in the February issue.

In the July and September issues it was shown that the variations in bolts and spikes are so amazingly numerous and diverse as almost to defy description; yet substantially all of these variations are in minor details and so inconsequential that they do not affect the utility of these devices. In fact, it was shown that many of them are less than the tolerances permitted by the specifications.

These few of the many details which might have been mentioned have been reviewed as typical of the conditions found in the designs of all track materials and tools. However, being typical, they emphasize the absurdities which occur with such frequency in the designs for these devices. Furthermore, it should not be overlooked that the specifications under which some of these articles are manufactured are almost as diverse as the designs.

Non-Essential Details

One of the most important arguments advanced by the advocates of rigid standardization is that the multitude of designs now employed differ only in non-essential details and that these differences do not affect utility, but that they do add materially to the cost of manufacture, which must ultimately be passed along to the railways. This contention has been shown to be true only in part, since essential differences were pointed out, even where a single basic design is followed closely. These are illustrated by the toeless joint and the angle bar; by single and double-shoulder tie plates, as well as by the method of fastening the plates to the ties; by the length and shape of wrench handles; by the tamping heads on tamping picks and tamping bars; by the variations in the shape of the heads of adzes; and by similar essential differences in other tools and materials. Yet, it is clear that there is a wholly unnecessary number of designs for practically all of these devices.

More than 1,000 designs of rail joints are in current use.

More than 5,000 different drillings are applied to these bars.

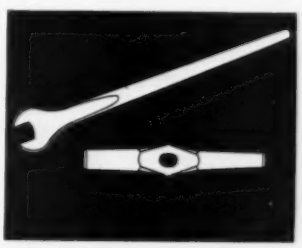
More than a dozen drillings are already being used with the 112 and 131-lb. rail sections adopted two years ago.

Twenty-five roads using identical joint-bar sections for 110-lb. R. E. rail have 25 different drillings.

On the other hand, this group has understated rather than overstated its case with respect to the waste that occurs by reason of this unnecessary multiplicity of designs. Again, in part at least, it has failed to place as much emphasis as is warranted on the frequency with which designs are changed, for these changes entail fully as much, and in some cases more, waste than the diversity of designs itself, particularly since several manufacturers are usually involved, because dies, rolls, patterns, etc., must be virtually discarded without the benefit of amortization when designs are changed.

Considerable emphasis has also been placed by the advocates of standardization, as it should be, on the seasonal character of manufacturing operations induced by both the multiplicity of designs and by the frequent changes that are made in design. At the same time, they have overlooked an important factor in adding to the manufacturer's cost, and, therefore, to the price of his products. This is the practice of placing small orders, not only for tools but for track materials as well. Since this series began, information has come in of orders as small as for 50 tons of rail and 50 tons of tie plates. In these cases, the cost of setting up and dismantling the rolls has sometimes been as great as the price received for the shipments.

It is not debatable that manufacturing costs are increased, in most cases unreasonably, by reason of the



present diversity of designs for practically every device and tool employed in track construction and maintenance. Details of the manner in which costs are increased by this diversity were discussed at some length in each of the articles on specific devices, in the belief that railway engineers had little appreciation of this phase of the manufacturer's problem. In some cases, however, any attempt to eliminate this waste by standardizing designs would be futile unless specifications were also standardized.

Is There A Trend?

Is there a discernible trend toward standardization? If so, is it the result of natural evolution, or is it occurring by reason of concerted action on the part of some agency or agencies? These are questions that cannot be answered categorically, since trends are evident in some cases but not discernible in others. Practically, standardization has been achieved in sledges without conscious effort on the part of any agency. There has been almost as decided a natural trend toward standardizing clay picks; although this simple tool is still marked by some 10 or 12 special designs, as contrasted with a single design for sledges.

On the other hand, although the designs for tamping picks were originally far more numerous than for clay picks, and while these designs have now been reduced by natural evolution to substantially the same number as those for the latter tool, standardization has not been so nearly achieved because there are essential differences in the designs for the tamping heads. Strangely enough, despite the fact that for years there was a greater diversity in the designs for the eyes than for other details in both of these tools, the eyes have been reduced to a common standard which is accepted today by all but three roads.

Reduction

That there has been a definite reduction in the number of designs for some other materials and tools, as compared with 30 or 40, or even 20, years ago, cannot be denied. In some cases this trend, if allowed to continue its natural evolution, probably will approach standardization; in others there are no indications that it will. The reason for this latter situation is that there are essential differences in some of the designs which will be difficult, if not impossible, to compose, although

Three designs of claw bars account for 75 to 85 per cent of the production.

The remaining 15 to 25 per cent are made to 47 special designs.

Lengths differ by as little as 1-2 in.

basically these designs do not differ greatly.

When we consider wrenches, bolts, tie plates and adzes, we find a different situation. In these devices there is not only no trend toward standardization, but not even toward a reduction in the number of designs. In fact, in the case of tie plates, there are more designs today than there were 20 years ago.

In still other devices, such as rail, rail joints, spike mauls and chisels, there has been a marked reduction in the number of designs, as compared with only a few years ago. Yet, although the A.R.E.A. designs for spike mauls account for 80 per cent of the total production of this tool, only the most optimistic would say that it has yet been reduced to a standard. Chisels are still farther from this objective. In each of these tools, however, the eyes have been reduced to a single design. Rails and joints are still far from being standardized.

It will be seen, therefore, that in a few cases there is a definite trend toward standardization; in others there has been a marked reduction in the number of designs without any approach to standardization, except occasionally in some detail; while in still others there has not been even a reduction in the number of designs, although there is no marked departure from a single fundamental design in any of these cases. On the whole, it can be said that there is no natural trend toward standardization, although there is a general trend toward a reduction in the number of designs for many

More than 400 rail sections in 69 weights are in the main track of Class I roads today.

Individual producers are today maintaining rolls for 25 to 140 sections.

Identical dimensions differ by as little as 1-64 and 1-128 in.

Fourteen different designs of 100-lb. rail are being rolled currently.

track materials and tools. Yet this latter movement is exceedingly slow and in the ordinary course of events it may be years before it has progressed to the point where it will be of real benefit to the railways. Even organized efforts to bring about standardization have as yet been of little effect.

In view of the facts which have been presented with respect to the diversity of designs and the unnecessary costs which they impose upon manufacture, it is obvious that something should be done to correct the situation. The first question that arises in this connection is whether this correction should be made voluntarily by the roads individually or whether there should be collective action. Before this question is answered, however, it is well to examine some of the reasons for the present diversity in designs and specifications.

Without Reason

It has already been shown that some of the practices with respect to design have been handed down from the early days of railway development; in other cases, that differences in the conditions on different roads account for some of the variations; and that still others can be traced to a deep-seated belief on the part of many engineers that their own designs are better suited to their own needs and are, therefore, superior to all others. Yet, when all of these factors have been considered, they do not account for many of the variations in design, particularly those in inconsequential details, a large number of which appear to have been made without any reason.

In seeking an explanation for this latter group, one cannot fail to be impressed by the striking indications leading to the conclusion that few designers have any detailed knowledge of manufacturing operations and they are, therefore, largely ignorant of the effect their designs will have on manufacturing costs. For this reason, if, when developing designs for various devices, the roads would send their designers to the plants that are to make the articles, for the purpose of studying the shop or mill operations involved, many of the minor differences, in details at least, would be entirely eliminated.

Such a procedure would also doubtless have considerable effect on the frequency with which designs are changed. This is an individual action which any road can take with-

out reference to what others may do. Further than this, however, for obvious reasons, individual action would be only partially effective.

It is evident, therefore, that the correction of the present situation with respect to diversity of designs and specifications lies in collective action. Fortunately, in the American Railway Engineering Association, the railways have an agency that is well equipped to carry out such a plan, making it unnecessary to set up new machinery for the purpose. This association has been studying maintenance and engineering practices for more than a third of a century, and has a commendable record of achievement in coordinating and standardizing construction and maintenance practices. In pursuance of this work, it has already adopted as recommended practice, standards for many of the devices which are now under discussion. Others that have been proposed by the committees making the studies, have failed of adoption, however.

In view of the recognized influence of this association on construction and maintenance practices, and in further view of the fact that some of its recommended practices, its steel-bridge specifications for example, enjoy a wide application, the question at once arises as to why its recommendations with respect to track materials and tools have not received equally wide acceptance, and why the association itself has rejected the designs for other devices which have been recommended to it for adoption.

We will leave this question for a moment and turn to the Division of Simplified Practice of the Department of Commerce to find what its experience has been. When it began its studies, it found a situation similar to that with track materials and tools, but in many instances far more aggravated, as was shown in the first article of this series. Its investigations, which have covered a wide range of manufactured products, have shown that, with few exceptions, when a multiplicity of designs prevails, the bulk of the production is confined to a relatively small number of designs.

Reaction

It has also been the experience of the division that the first reaction of both producers and consumers is that no reduction in the number of designs can be made. After they have studied the subject for some time, however, and have learned how small some of the differences in design are, the tendency is to swing far in the opposite direction and recommend reductions that are not warranted by the conditions under which the products are used. In not a few cases, it has been proposed by the committee studying a particular product, to standardize rigidly on a single design and *compel* adherence to this design without considering fully the needs of the using industries.

Manufacturers maintain dies for more than 600 designs of track bolts, with 13 diameters and more than 40 lengths.

Diameters differ by as little as 1-32 in. and lengths by 1-16 in.

Current designs for nuts number more than 2,500.

This tendency was exemplified by paving brick, which was being produced originally in 66 different sizes and shapes. This seemed to be so simple a product that the first recommendation was for rigid standardization on a single size. Further study disclosed the need for more sizes and shapes and, finally, four were retained. It was found later, however, that even this was going too far and one additional size was restored. Still later, it was shown that certain conditions could not be met by any of the five sizes then being produced and in recent months a second size has been restored, so that now a total of six sizes is being manufactured.

Is It Practical?

This brings us to the question of whether standardization is practical. In other words, whether a standard can be developed which will meet the requirements of all of the roads. This is the principal bone of contention between the advocates and opponents of rigid standardization, the former contending that a design which will serve one road should be equally satisfactory for another, while the latter maintain as stoutly that there are differences in conditions which can be met only by essential differences in design.

More than 200 designs of track spikes are in current use.

Every one of these designs can be used with any rail section.

Numerous variations in individual dimensions are less than the tolerances permitted by the specifications.

It is not uncommon for a road to change its design oftener than once a year.

No Hardship

In the article on sledges it was shown that they have practically reached the point of standardization, except that a few roads still differ in their specifications for the steel from which they are made. It was also shown that the A.R.E.A. designs for spike mauls, chisels and clay picks have been accepted by all but a few roads, and that the special designs used by these roads do not differ in any important particular from those of the A.R.E.A. Standardization of these tools would, therefore, impose no hardship or inconvenience on the few roads that still insist on their own special designs. As was pointed out, complete acceptance of the A.R.E.A. designs and specifications for these four tools seems to be the logical solution of the problems they present.

Likewise, it was shown that no such easy solution seems possible for any of the other materials and tools under discussion, since there is a greater diversity in the designs and some of them differ essentially from the others. Tie plates, for instance, are admittedly still in the relatively early stages of development and, while in some respects the designs for this device have been stabilized, few engineers are satisfied with their own designs and they are changing them with considerable frequency in an effort to improve them. Since these essential differences exist in so many devices, and since they have in large measure been brought about by differences in the conditions on the various roads, it is questionable whether a rigid standard for any of them can be developed which will meet the requirements of all of the roads. In confirmation of this belief, it has been the experience of the Division of Simplified Practice in other industries that only in rare instances is rigid standardization either practicable or desirable.

Is Rigidity Acceptable?

In view of the foregoing we are led logically to inquire whether the railways will accept rigid standards for track materials and tools if they are developed. Substantially every one of these devices is undergoing a certain amount of development;

otherwise the designs would become completely static. Not a few engineers look upon this as an important reason for refusing to accept rigid standards, for they are aware that changes in engineering practices, operating methods, materials and equipment, are taking place today at a rate never before equalled. They are firmly convinced that standardization would tend to bar further progress in the improvement of materials and tools by freezing the designs and thus smothering initiative, thereby hampering them in their efforts to keep ahead of the constantly changing developments in transportation as the railways seek to meet the competition to which they are being subjected to an increasing degree today.

Reluctance

Rail provides an excellent illustration of the difficulty of obtaining acceptance of standards. Fifty years ago rail design and rail manufacture were in complete chaos. When the A.S.C.E. sections appeared in 1893, almost at once they accounted for two-thirds of the rail production of the country. Some roads, however, never placed a second order; others continued to use them for a few years and discarded them as unsuited to their conditions; while others continued to use them for more than three decades. Since that time the railways have consistently shown an eagerness for and have co-operated in the development of a rail section which could be accepted as a standard. Yet, despite the many years of study and intensive efforts to develop such a section, not one of those that have been proposed have gained wide acceptance. In fact, some of the roads that participated most actively in these developments never accepted them.

Other examples might have been given, but this is sufficient to illustrate that human nature, being what it is, must be taken into account in any movement having standardization as its objective. The decisive rejection by the A.R.E.A. of the proposed standards for tie plates affords a still more recent but slightly different example of the reaction that may be expected to efforts to impose rigid standards. These examples illustrate two types of widespread opposition to standardization, the passive and the active. The advocates of rigid standardization should recognize that they cannot be successful in gaining acceptance of their designs so long as they face either indifference or open opposition.

If rigid standardization is either impractical or will not be accepted, what should be done about it? Should the railways allow the present diversity of designs to continue, relying on natural evolution eventually to eliminate the problems which are so inherently a part of the present system? Or is there some alternate course which is superior to either rigid standardization or unrestrained individualism?

In the several articles in which specific devices were discussed, it was shown that the increased cost of manufacture was caused in part by the investment which must be made in rolls, dies, patterns, etc., as a result of the diverse designs, and that this investment is multiplied by the number of mills with which a road places its orders; in part by the fact that many of these rolls, dies, etc., are made obsolete by changes in design, for which reason the investment is never amortized completely; and also by the further fact that although other rolls, dies, etc., are eventually worn out, the manufacturer is compelled to absorb the carrying charge on the unamortized part of the investment over a period of years. It was also shown that the seasonal operations created by the present wide diversity of designs add to the cost of manufacture and that these costs are still further increased by reason of small orders for special designs.

Basic Differences Few

Again, it has been shown that the essential departures from the basic design are relatively few for any device, including those having the greatest multiplicity of designs, and that the remainder of the variations are of minor character, in non-essential details, which do not affect utility. It has also been shown that in every case these minor differences can be eliminated without imposing any hardship, or even inconvenience, on the user or detracting in any way from the usefulness of service characteristics of the device. Yet preferences for certain features of design are so deeply rooted that they may be expected to persist despite all efforts to the contrary.

Three facts have been overlooked, or ignored, by the advocates of rigid standardization: (1) The relative few essential differences in design and the fact that most of them rest on real differences in conditions; (2) that human nature is stubborn and will hold fast to its preferences, whether they are based on fact or fancy; and (3) that the economy of rigid standardization has been overrated.

At this point *Railway Engineering and Maintenance* will offer what it believes to be the solution of the problems which have been discussed. In each of the studies of specific devices it has been shown that it is possible to reduce the present diversity of designs to a relatively few, and yet retain all of the fundamental features of the designs which they replace. It has also been shown that there is a limit to the number of designs beyond which there is little or no further economy from standardization. In other words, a limited number of designs for any track material or tool will be of no disadvantage to the manufacturer, since the normal demand will enable him to amortize his rolls or dies within a reasonable time, and he will effect the same economy in production that would be possible through concentration on a single design of the device.

The Solution

Railway Engineering and Maintenance, therefore, offers simplification as the solution of these problems. But if the designs are reduced to a few, it is important that they be so chosen as to retain all of the fundamental features of those they replace, so that the roads will still be able to select the design or designs best suited to their varying needs, in which case they can be expected to give them more universal acceptance. In large part it has been the fact that no opportunity is given to make a selection that has retarded acceptance of the present A.R.E.A. designs for track materials and tools.

Will simplification of design, by reducing the manufacturer's costs, make a corresponding reduction in the price that the railways must pay for his products? Obviously, this question cannot be answered directly. On the other hand, the Division of Simplification has made a very careful check of the price trends for every product for which simplification schedules have been promulgated.

The resulting figures show that the decrease in manufacturing costs resulting from simplification has eventually been reflected in declining prices, although it has in some instances, required from five to seven years before all of these economies have been passed along to the consumers. There is no reason to believe that the experience of the railways will be different if they are willing to undertake simplification of the designs of track materials and tools.

Making Pile Bridges Last Longer*

By I. L. SIMMONS

Bridge Engineer, Rock Island Lines, Chicago

EARLY in 1930 it became evident to the managements of the railroads that we were entering a rather long period of declining revenues, and that means should be taken to reduce expenditures so far as consistent with safety of operation. Such measures as reductions in forces, limitations of renewals, etc., were adopted. Purchases of material were likewise reduced. Subsequent years saw further reductions in revenues, with further reductions in forces, renewals, and purchases of material. Bridges and structures that in normal periods would have been due for renewal had to be repaired and kept in safe condition until such time as money is available for their complete renewal. That these conditions have placed additional responsibility upon every one is not denied; that they will be met is not doubted by any one.

What Can We Do?

We have now passed through five years without any major renewals, and the end is not yet in sight. The question uppermost in our mind is, "What can we do to carry our structures longer, economically if possible?" The first step is to find out what is necessary to do. To determine the amount of work necessary it is mandatory that a thorough inspection be made of each structure by the properly designated officers, preferably the master carpenter or the superintendent of bridges, or both and a careful record made of the amounts and kinds of material required to carry the structures in a safe condition. This inspection and record should be made in such detail that, in the event of complete renewal, the amounts and kinds of serviceable materials released will be available for use in formulating a division program of repairs to various kinds of structures.

I believe that second-hand material released should be used, so far as possible, in repairing such structures as loading platforms, coal chutes, etc., where the maintenance of the facility alone is the major consideration. Such new material as is bought should be used in structures where both the physical property and human life are involved.

In making the inspection, safety of operation should be the motto in determining the *amount* of work to be done, and economy the yardstick in determining *how* it should be done. After the inspection is made and the amount of material available for reuse and its suitability for repairs determined, one can decide the number of bridges that should be renewed entirely in order to furnish the necessary repair material for the remainder of the structures.

Selection of Material

I wish to lay particular stress upon the selection of material. In making this selection one must consider not only the work the material has to perform, but also the general condition and probable life of the remainder of the structure. It is manifestly poor policy to insert a timber that has a remaining life of 4 years in a structure which has a remaining life of 6 to 8 years. It may answer the requirements of safety but not of economy. The life of the structure must be kept constantly in mind, and such repairs as are made should be made so thoroughly that it will be unnecessary to send a bridge crew to the structure again for that purpose.

A great deal has been written about the maintenance of pile trestles, including the splendid report presented before this organization in 1934 on the Maintenance of Ballast-Deck Trestles. Much of the information contained in that report is applicable to all types of timber trestles.

A pile trestle may be divided into two parts, the substructure and the superstructure; the piling, caps, and sway bracing comprising the substructure, and the stringers and ties comprising the superstructure. Probably the most costly portion of our maintenance occurs in the substructure. Being composed of several parts, it is subject to many ailments. The piling decays either at the ground line, or it decays and splits at the top.

A Double-Capping Job

Helper Piles Were Used Here

Piles may settle individually, or a bent (due to poor driving) may settle as a whole. Caps decay and break. Sway bracing may break or become loose. All of these defects should be attended to in order to confine the trouble to the member itself, and not allow a minor ailment to develop into a contagion and ruin the entire bent.

Method of Repair

If a pile is decayed either at the top or at the ground line, it is not able to do its part of the work. The result may be either a broken cap or settlement of the entire bent. Repairs should be made at once. If there should be not more than two such piles in a bent, they may be treated individually. If the trouble is at the

*Abstracted from a paper presented before the convention of the American Railway Bridge & Building Association on October 16.

ground line, the pile should be exposed by excavating to a point where the timber is sound and then cut off, and a post inserted, toe-nailed to the pile stub and drift-bolted to the cap, and the earth then replaced and thoroughly tamped in place. If the pile is decayed or split at the top for not more than 14 in. or the depth of a cap, a header block may be used, but if the defect extends more than 14 in., a post should be inserted. If there are more than two piles in this condition in any one bent, the bent should be double-capped.

The settlement of individual piling is an indication of poor field work, and should be corrected by driving a helper pile. Shimming in this case may help the bearing of the cap, but it is merely playing with the trouble. Settlement of the entire bent demands either that new piling be driven or that the present piling be driven to a firm bearing and a frame bent installed on the pile stubs. I favor the latter method, if the piles are creosoted and their condition is such as to warrant this measure. Blocking and shimming under the cap do not effect a cure, but merely temporize with the situation and are expensive in the end.

Broken Caps

Broken caps are a signal for a thorough investigation of the entire bent. The piling should be investigated as to settlement and spacing under the cap. If the trouble is due to settlement of the bent, the deck should be opened, the cap removed, and all piling driven down to a firm bearing. This may necessitate double-capping the bent. If the piles have been driven to any great depth a frame bent should be used. If only track piling are affected, helper piles may be found effective. If the break is due to improper spacing, the drift bolts should be removed and the piles drawn into their proper places.

Probably no part of a trestle is subject to such a wide variation in length of life as the stringer. The outside stringers may deteriorate faster than the inside stringers in one panel, and the reverse may be true in the next one. This makes repairs somewhat of a problem. If there is one questionable stringer in a panel, a helper stringer may be used to advantage, as it does not involve disturbance of the track. If there are more than one such stringers and the traffic is heavy, a careful investigation should be made to determine the advisability of replacing the entire deck with new material, using the material recovered for repairs.

The annual loss of pile trestles by fire is a matter for serious consideration, both on account of the hazard to operation and the cost of replacement. A number of methods have been used with success to protect the bridge, the most common practice being to cover the decks with second-hand car roofing or crushed rock. This method affords protection only for the top of the bridge. As yet no device has been used for the protection of the piling except the precaution of keeping grass and weeds cut away from them. This, if thoroughly done, will continue to yield good returns.

In conclusion I wish to lay particular emphasis upon the importance of programming and organizing your work. Avoid running a pile driver over your district for a scattered pile here and there. Where permissible, use the post method. Select for complete renewal structures that are as close together as possible, and do all the driving at one time. Avoid moving your crews back and forth, but make progress in one direction. Traveling causes loss of time and money.

Have your bridge and building foreman make frequent inspections over their districts and see that materials are delivered in proper sequence. Study your work. If your program is carefully made and followed, and the work is thoroughly done, you will obtain results gratifying to yourselves and satisfactory to your employer.

An Economical Air-Lift Installation

AN economical air-lift installation proved the solution for a troublesome problem encountered by the Denver & Salt Lake in providing the water supply for its engine terminal and yard at Utah Junction (Denver), Colo. The water had been delivered previously by a turbine pump but the presence of appreciable quantities of sand in the water had resulted in excessive wear and the eventual failure of the pump.

The log of the well, which is 650 ft. deep is as follows:

Top	108 ft.—blue shale
	10 ft.—Water-bearing strata
	230 ft.—blue shale
	15 ft.—water-bearing strata
	50 ft.—blue shale and sand
	20 ft.—sand
	30 ft.—slate
	70 ft.—Water-bearing strata
Bottom	87 ft.—blue shale

The well was cased, beginning at the top, with 100 ft. of 10-in. casing, 520 ft. of 8¾-in. casing and 115 ft. of 6¼-in. casing. The 8¾-in. casing was provided with a 20-ft. length of perforated pipe at the level of the second or 15-ft. water-bearing statum and another of the same length near the top of the lower or 70 ft. water-bearing stratum. Sand entering the casing through these perforations resulted in the failure of the pump.

The Air-Lift Described

As the well is only a short distance from the terminal power plant, which is equipped with a Diesel-engine-driven air compressor, the idea of using an air lift was suggested as a way out of the difficulty. The compressed air was delivered through a 1¼-in. line which was extended into the well and reduced to 1 in. for a connection to a 6-ft. 8-in. No. 5 VA Ingersoll-Rand foot piece. The air lift column above this foot piece consists of a lower section comprising 259 ft. 3 in. of 3½-in. pipe and an upper section embracing 202 ft. 2 in. of 4½-in. pipe. From the top of the column the water is delivered to the storage tank through a 4-in. black iron pipe. The outlet in this tank is 15 ft. above the bottom of the tank and is equipped with a head piece of the umbrella type.

The starting air pressure required under the condition of submergence imposed in this well is about 115 lb., and as this pressure is not available from the existing compressor plant a 9½-in. locomotive-type air pump was installed to serve as a booster. As the air lift ceases to operate if the pressure is reduced to 110 lb., the delivery of the water is readily started and stopped by starting and stopping the booster compressor. This is done manually in the power plant when and as required to maintain the water level within necessary limits.

Little sand has been carried out with the water since the air lift has been installed owing to the practice of "back-blowing" the well at least once a week. To do this air pressure is applied with the discharge line closed, with the result that the air is forced out of the foot piece, causing a reverse flow through the perforated sections of the casing, which stirs up the sand that accumulates around the strainer so that it settles to the bottom of the well. The installation has proved thoroughly satisfactory and readily delivers an average of 150,000 gal. of water consumed at this point daily. We are indebted to W. C. Jones and Charles Peterson, chief engineer and master mechanic, respectively, of the Denver & Salt Lake for the information presented here.

The Place of the Railroads in Transportation*

By G. S. Fanning
Chief Engineer, Erie, Cleveland, Ohio

RECENT years have brought new inventions of seeming basic importance in the fields of electricity and the internal combustion engine. New facilities for transport, the automobile, the bus and truck, and air-craft have caught the public fancy, and the agitation for more inland waterways has become more persistent. These agencies seem to challenge the supremacy of the railroads for inland transport. Can they take the place of the railroads? We can best answer that question by asking another. What do passengers and shippers require of transportation agencies? They require adequate service at low cost. Adequate service includes (1) safety, (2) reliability, (3) speed, (4) convenience, (5) comfort (for passenger service). Each of these elements of service has its effect upon cost.

Let us look at our competitors in the light of these requirements.

What do we find as to the service offered by inland waterways? As to safety we offer no argument, although coast-wise traffic is subject to such perils of the sea as the hurricanes off Florida, which form one excuse for an economically unsound canal across the peninsula. As to reliability, we challenge the adequacy of any service that must be suspended during fall, winter, and spring months because of fog, ice and flood. As to speed, American agriculture and industry generally have reached a point in their development where four miles per hour, the normal rate of traffic on inland canals, is no longer acceptable in their economic set up. As to convenience, waterways at their best can reach but few agricultural and industrial areas directly. They must be reached by most users through other supplemental transportation agencies. Furthermore, but few waterways have established common carrier lines. Their principal benefit has been to certain private interests that can afford to own their own vessels and operate them toll-free on the waterways which the romantic taxpayers have so generously provided. As to costs, as long as the waterways are free, their transportation costs will appear to be low and water carriers will continue to make their rates a differential, usually 80 per cent, of the rail rate.

Inland waterways may continue for a while to chisel traffic from the railroads and make it necessary for the remaining traffic to pay a higher rate, but fundamentally they give no promise of being able to supplant the railroads even in territory where they now exist.

What about the service offered by our competitors on the highways? As to safety, the front pages of our daily papers record the death and destruction which these irresponsible unregulated operations cause throughout the land. Their reliability depends almost entirely on the responsibility of the operators, with many of whom it is entirely lacking. In addition, snow and ice seriously slow up or interrupt their operations, except on main trunk roads where the public authorities keep the roads open with the taxpayers money.

As to speed, with the present density of traffic on the highways, it is generally satisfactory, but this condition could not continue with any substantial increase in density without the construction of additional hard surface roads. To provide enough highways to take care of all or any major part of the traffic now moving on the rails is an obvious impossibility in the face of the tax burden already awaiting the coming generation.

Convenience is the principal element of the service that the trucks and busses have had to offer. They have come directly to the shipper's door for a load and delivered it directly at the receiver's door. This service is now being met by the railroads in their door-to-door delivery.

The comfort of passengers in busses is notoriously much less than in modern air-conditioned railroad coaches. Costs to the shipper by truck or the passenger by bus have generally been less than by rail. As long as they have a virtual subsidy in the use of public constructed and maintained highways, their lower operating costs will continue. The carriers have hitherto enjoyed immunity from government regulation as to service; accounts, records and reports; safety of operation and equipment; and rates, fares and charges;—with the result that their operating costs have been reduced at the expense of safety and their charges have been determined not by the real cost, but by undercutting the rail rate. These unfair advantages arising from the lack of regulation will, it is hoped, be corrected by the Motor Carrier Act of 1935 which places the regulation of common and contract motor carriers under the jurisdiction of the Interstate Commerce Commission.

Our newest competitor is transport by air. The younger generation is unquestionably air-minded, but stripped of romance and thrill, what has air transport to offer?

As to safety, it offers less than nothing. It is said that when a man flies he takes 66 times the risk he encounters on the ground. Most engineering structures, including railroads, are built with a factor of safety of from four to six; that is, they have four to six times the strength required to withstand the strains to which it is known they will be subjected. This safety factor takes care of extraordinary conditions that might, but are not likely to, arise. Obviously this method of design adds weight to any structure or vehicle. With such added weight, air craft of the heavier-than-air type would be unable to rise from the ground, so the factor of safety is greatly reduced and when a plane encounters an extraordinary situation in the air cracks up. To avoid this, planes are kept out of the air when these extraordinary occasions are likely to arise and that makes them about as reliable as the weather. In speed, they exceed anything which the railroads can ever hope to attain. Some of the time saved in flight is lost due to the usually remote locations of landing fields. Their costs to the passenger are no more favorable than the railroads, in spite of subsidies.

What have the rails to offer their customers?—Safety greater than that of their own homes; reliability almost clock-like the year round, summer and winter, day or night, fair weather or foul; reasonable speed, increasing convenience and comfort; and at costs commensurate with the service offered. We are still far from perfect; time lost in handling traffic at terminals and through yards must be reduced, schedules made as frequent and convenient as practicable, costs reduced wherever possible—and what we have learned about that in these years of distress! With all our failings, we are still the backbone of the nation's transportation system. We can co-ordinate these other agencies as the useful supplements that they should be and the rails can be the "tops"—if we have faith and tell the world about it.

*Abstracted from a paper read before the Roadmasters and Maintenance of Way Association on September 17.

What's the Answer?

Elevation of Crossing Surface

Should the surface of a highway crossing be higher or lower than the top of rail? Why? If so, how much?

Favors Two Heights

By A. C. Harvey
Chief Engineer, New York, Chicago & St. Louis, Cleveland, Ohio

On the outside of the rail the surface of the crossing should be kept lower than the top of the rail; between the rails, the rails and crossing should be at the same level. That portion of the crossing outside of the rail should be depressed enough to prevent it from being damaged, or possibly destroyed, by contact with worn wheel treads. By making the surface between the rails level with the top of rail, the riding qualities of the crossing will be improved.

It has been my observation that a depression of ¼ in. below the top of rail for the outside sections is sufficient to protect them from damage by worn wheel treads. If the surface of the crossing and the surface and grade on the approaches are well maintained, the slight amount that the rail extends above the crossing, as suggested, will cause no appreciable bumps to vehicles using the crossing.

Should Be Lower

By A. Chinn
Chief Engineer, Alton, Chicago

The surface of a highway crossing should always be lower than the top of rail. Obviously, the sections inside and outside of the rail should be of the same elevation, and this makes the outside section the determining factor. The reason for this is that the treads of locomotive and car wheels sometimes become worn or cupped, or in common parlance, they have a false flange which extends slightly below the running surface of the rail on the outer side of the wheel. If, therefore, the surface of the highway outside of the rail is at the same elevation or higher than the top of rail, this secondary flange will ride on it adjacent to the outer edge of the rail and damage it. A metallic crossing may thus be bent, or the top section may be broken, for such crossings are not designed to carry the heavy wheel loads of locomotive or cars.

In general, the top of rail should be at least ¼ in. higher than the surface of the crossing. This will give ample depth to keep the secondary flanges away from the crossing surface, even after some allowance for wear in the rail. At the same time, this difference in elevation will not be so great as to cause objectionable riding qualities in highway vehicles.

Smooth Surface Is Problem

By John S. Hutchins
Sales Engineer, Ramapo-Ajax Corporation, Chicago

One of the major problems in the construction of highway grade crossings is to provide a smooth surface for highway traffic and to maintain it at minimum cost. Smooth passage of highway vehicles is of increasing importance today because of the present high speeds on the highways. Including city streets and rural highways, there are almost a quarter million crossings at grade in this country, and this number increases yearly despite the large number of grade separations completed annually.

Until recently, the standards for highway crossings have been rather haphazard but basically similar, no matter what materials have been employed to fill the space between the rails. All of these crossings have depended on either the ties or the ballast, or both, for their support.

As the buses and trucks operating over the highways have become heavier, these older crossings have shown a decided tendency to depress under the loads and to disintegrate, necessitating continuous maintenance expense to keep them in proper surface. In most cases, the first step taken to remedy these conditions was to increase the thickness of the crossing material, thus raising the surface of the crossing above the rail. This was

Send your answers to any of the questions to the What's the Answer editor. He will welcome also any questions you wish to have discussed.

To Be Answered in February

1. *When laying rail, where only a part of the ties have tie plates, should new tie plates be applied to the previously unplated ties by the rail gang? Why? If not, when and by whom should they be applied?*
2. *Where a concrete abutment shows signs of tipping, what should be done?*
3. *Does the kind of ballast have any effect on the life of treated ties? Of untreated ties? If so, what? Are hardwoods or softwoods more affected? Why?*
4. *What is blue stain in lumber? Does this stain affect its use? If so, in what way? How can it be prevented?*
5. *What effect does irregular line have on the riding qualities of the track? On track maintenance? Why?*
6. *Should a suction line serving a centrifugal pump be larger than the discharge line? A displacement pump? Why? If so, how much? How is this determined?*
7. *When regaging a curve, should the gaging be done on the inside or the outside rail? Why?*
8. *When inspecting light steel spans, how can one detect evidence of over-stress?*

soon proved to be a mistake, for the crossing quickly developed rough-riding qualities.

Regardless of how dangerous it may be for vehicles to approach or pass over a grade crossing at high speed, it is a fact that must be given recognition that the public is, in general, entirely heedless of this danger, as is evidenced by the number of vehicles that are driven into the sides of trains. Because of these vehicular speeds, a crossing that is not practically level with the top of rail is a source of danger and of irritation to the public, and is usually made the basis of complaints by highway departments until remedied.

At present, not a few designs of crossings are available which solve this problem of smooth-riding surfaces in a simple way. They provide permanent types of units, each of which is readily removable, without necessitating the disturbance of the remainder, and they are of the proper size and thickness to bring the surface of the crossing to the desired level with respect to the top of rail. In all cases, however, provision must be made for clearance for worn wheel treads which overhang the outside of the rail for about 1 to 1½ in. In most cases these units, or crossing members, no longer depend on the ties and roadbed to give them their direct support, but rest on the flanges of the rail throughout the length of the crossing, with only the necessary insulation intervening between the rail and the crossing members.

In this way, a smooth surface, even with the rail, can be maintained permanently, with almost negligible cost of maintenance, and public complaints reduced correspondingly. Not a few costly grade-separation projects have been postponed indefinitely by the simple expedient of improving the crossing surface to insure permanent smooth-riding conditions, for a level crossing breeds no complaints.

Inclination for Snow Fences

Should a portable snow fence be vertical or inclined? Why? If the latter, should the inclination be toward or away from the direction of the prevailing wind? Why?

Away from the Wind

By Bernard Blum
Chief Engineer, Northern Pacific, St. Paul, Minn.

Inclined portable snow fences have been standard on the Northern Pacific for many years. They were adopted because of the comparative ease with which they could be set up, with the minimum amount of staking and also because they can be easily nested for storage during the summer. This type has given excellent service in territory where deep snow and high winds are common. I do not believe that the efficiency of a potrable panel depends on whether it is vertical or inclined. It has been our practice to have the inclination away from the direction of the prevailing wind, but I do not believe there is much difference in the effectiveness of such a fence as compared with vertical fences or those that are inclined against the wind. Our portable fence is so designed that the overhanging baffle to the inclined fence is provided on the brace members, so that naturally the panels face the prevailing wind, as described.

Of late, some of our roadmasters have advocated the adoption, or at least a trial, of vertical portable fence, giving as a reason for their recommendation the fact that such panels can be constructed with less material and will thus be lighter to handle in the field, an important consideration with depleted section forces. It is my belief that there will be little difference in the material required for vertical and inclined fences of the same height, provided both have the same strength and resistance to overturning.

We have found that the effectiveness of and the protection afforded by snow fences are a function of the height and the opening between the boards. The tight board fence is admittedly the most effective, and this effectiveness varies inversely with the width of the opening between the boards. The height of the fence is also of considerable importance, the amount of snow caught and deposited being dependent in large measure on this factor. Experience has shown that tight fences cause the deposition of considerable snow on the windward as well as the lee side of the fence.

It is difficult to make comparative tests of the effectiveness of snow fences of varying designs for the reason that this will vary with the direction and velocity of the wind, and the terrain contiguous to the cut being protected, as well as the design and position of the fence. Accordingly, it is difficult to obtain identical conditions under which one type of panel can be compared with another.

Should Be Vertical

By P. C. Newbegin
Chief Engineer, Bangor & Aroostook, Houlton, Maine

Portable as well as permanent snow fence should be vertical. The function of a snow fence is to prevent the drifting of snow at some particular place. This is accomplished by retarding the velocity of the wind and causing the snow to be deposited in the vicinity of the fence rather than at some point beyond it. A snow fence offers a greater obstruction to the wind when placed vertically than when inclined and thus becomes more effective.

If the fence is inclined, the accumulation of snow upon it will tend to break it down and may be sufficient to cause it to collapse. If placed vertically, the weight of the snow has practically no tendency to upset or crush the fence, and the cost of placing it and of repairing it will be reduced substantially.

Factors Uncertain

By District Engineer

I know of few things than can be done with less precision than that of comparing the effectiveness of two types of snow fence. I have seen two strings of identical fence set up under what seemed to be identical conditions, where one was highly effective while the other was disappointing in its results. Again, I have seen fences that were vertical and others that were inclined toward or away from the prevailing wind, where little difference could be seen in their performance. I once saw a continuous line of portable fence set up to protect two cuts, one about 5 ft. deep and the other 30 ft. in depth. During a severe storm the shallow cut was clear of snow at all times, while the other drifted full, although they were on a continuous tangent and there was only about 300 ft. of embankment between them.

A snow fence catches only the snow that is being blown along close to the ground. It is effective only to the degree to which it breaks the air current into eddies, thus reducing its velocity and, therefore, its carrying capacity. Obviously, a fence which is set at such an angle that the snow is deposited practically against its lee side loses much of its effectiveness as the drift gains in height. On the other

hand, if a slightly open space can be maintained back of the fence, it will not lose its effectiveness as the drift builds up. It has been my experience that this can be done by providing the proper spacing between the horizontal boards, and then setting the panels with an inclination toward the wind of slightly less than 30 deg. with the vertical. As the wind strikes the fence, it is deflected toward the ground from which it rebounds with a rolling eddy which causes it to deposit practically its entire burden of snow.

By deflecting the current to the ground in this way, the snow is not deposited until the rolling eddy forms, and a space back of the fence is kept clear for a continuation of this action. If the angle is properly chosen, it is possible to build a drift considerably higher than the fence without reducing its effectiveness.

Lining Ties on Single Track

On single track, should the ties be lined with the outer or inner rail on curves? Why?

Center the Ties

By A. Chinn
Chief Engineer, Alton, Chicago

Whether on single or multiple tracks, on curves or tangents, the best results are obtained when the ties are placed with their centers at the center of the track so as to give it equal support on both sides of the center. There is no particular reason, other than appearance, for lining the ties on one side of the track, that is, to either rail, and since, owing to variations in length, they cannot be lined on both sides, it would seem that the advantage in maintenance gained through equal support is more important than the doubtful advantage of appearance.

Line to Inside Rail

By C. D. Turley
Chief Tie Inspector, Illinois Central, Chicago

Perhaps the original and most fundamental reason for lining ties was to give the track a more presentable appearance, and this held true equally for curves and tangents. In recent years, the former rather wide variations in the length of crossties has been reduced materially, but even though this change greatly improves the general appearance of the track, a neat tie line is still considered an essential and an indication of a well-maintained track. On curves, the outside tie line is hidden by the ballast, but the inside line stands out prominently and, obviously, any small irregularities in the length of the ties are very noticeable.

The superelevation of the outer rail on curves depends on the degree of curvature and the speed of trains, and should be computed for the highest speed at which trains are operated. It is obvious then that low-speed trains, involving a large percentage of the freight traffic on any road, exert a greater thrust on and demand heavier service from the low rail. To provide a track structure which will withstand this heavy service, requires not only strength but uniformity. If ties are lined to the inner rail, a uniform bearing will be provided for this rail. Also, if there is a tendency for the track to heave, the heaving will likely be more pronounced on the low rail, owing to the greater amount of moisture, and a uniform tie condition will tend to keep the heaving uniform and reduce its ill effects to the minimum.

If a curve is in a cut the clearance is close, the maximum space and a uniform line for a drainage ditch are provided. There are many advantages and perhaps some disadvantages under certain local conditions, but I believe that ties should be lined to the inside rail on curves.

More Even in Length Now

By W. H. Sparks
General Inspector of Track, Chesapeake & Ohio, Russell, Ky.

Largely through the influence of the A.R.E.A. specifications, in recent years ties have been bought to closer tolerances than they were as recently as 8 or 10 years ago, for which reason they are coming in more even lengths. Prior to the general acceptance of the A.R.E.A. specifications, ties that were several inches either way from the specified length were accepted. Under these conditions it became almost imperative for appearance sake to line the ties to one rail or the other.

Aside from any question of appearance, however, it became the custom to line ties to the low rail on curves to insure an even support for this rail, which, on a line of mixed traffic in which slow trains generally predominate, carries an undue proportion of the traffic load. With the closer tolerances now demanded, the practice of lining the ties has become of less importance from the standpoint of either appearance or supporting the rail. For this reason, some roads are now making the center of their ties coincide with the center of the track. Yet, in no other place does the line or lack of line for the ties stand out so prominently as on the inside of a curve. Here, a ragged line, even where the maximum difference amounts to only about an inch, is quite noticeable and unpleasing. For this reason, I am decidedly in favor of continuing the practice of lining ties to the inner rail on curves.

It Is Immaterial

By Thomas Walker
Roadmaster, Louisville & Nashville, Evansville, Ind.

On double track the ties should be lined to the outside rail, whether on curve or tangent. One reason for this is that it presents a better appearance, especially where the inter-track space is filled to the level of the top of the ties with ballast. There is also a marked advantage in this practice where ditcher-spreaders or other roadway machines are used since no long ties will project out on the side used by the machines. The same rule might apply on single track where sidings adjoin the main track. In other words, a main track and a siding should be treated as a double track. On side-hill locations on single track, where a ditcher-spreader may be used, it may be advantageous to line the ties on the side used by the machine.

With the foregoing exceptions, it seems to me that on single track, it is immaterial to which side the ties are lined. I favor the practice of selecting one rail as the line rail and following it continuously on both curves and tangents. Crossties are now more uniform in length than they were a decade or two ago, and the arguments for or against lining them to a certain rail are not as important now as formerly.

Where prebored ties are used, and the boring is not symmetrical, that is, where one end is bored to fit a standard tie plate and the other is bored to allow for laying a different section of rail, the line rail should by all means be continuous. This permits laying the heavier rail continuously on the line side by pulling the inside spikes. If this is not done, when laying a heavier section, the new rail can be laid on

the line side only until a curve is reached and the rail gang will then be compelled to drop back and lay the other side to the same point, unless the line rail happens to be on the line side of the curve. If the line rail has to be switched to the opposite side when reaching the curve, this will leave a slight break in the alinement at each end of the curve, owing to the difference in the two sections of rail, which will have to be lined out. Making the line rail continuous, regardless of curves will eliminate this difficulty.

Where all four lines of spikes must be pulled, these remarks may not apply with the same force, but on the average single-track line it is not the usual practice to pull the outside spikes on the line rail when laying a heavier section, for obvious reasons.

Fastening the Rail to the Floor

What are the advantages and disadvantages of supporting the rail directly on the floors of concrete bridges or on concrete decks of steel bridges, as compared with ties and ballast?

No Disadvantages

By C. P. Disney
Bridge Engineer, Canadian National, Toronto, Ont.

A rail laid on a steel or concrete floor gives an absolutely perfect-riding track. It is also 100 per cent safe if the proper fastenings are used to hold it in place; while, practically, all danger of rail breakage is eliminated. With proper fastenings there can be no chance of the rails spreading and the track will have a billiard-table surface.

It is widely believed, and the bogey is often raised, that when passing from ballasted track onto the so-called rigid track, where the rail is fastened directly to the concrete, there will be a shock. Actual experience with a considerable number of structures, in some cases extending back as far as 37 years, proves that this shock is purely imaginary, since it does not occur. Even with a shock-recording instrument no bump of any kind is registered.

A further advantage of eliminating ties and ballast on the decks of structures is that it results in important economies. In most structures, particularly in a grade separation, the smaller the distance from the base of rail to the underside of the deck, the more economical the structure will be. In grade separations, the reduction of this distance affects the depth of excavation for the roadway, and extends to property damage, sewers, etc. Again, if 14 to 18 in. of ballast on the deck can be eliminated, it generally eliminates this much raise on the track approaches. This is often important, especially where the structure is in or near a terminal where a considerable number of tracks will be involved.

Furthermore, a considerable saving can be made in the dead load by eliminating ties and ballast. This, in turn, results in a saving in the amount of steel or concrete that will be required. An incidental economy is also effected in the substructure, since it does not have so much load to carry.

Another important economy is the almost complete elimination of maintenance. A ballasted deck with wood ties requires track maintenance, as well as maintenance of the waterproofed surfaces which, incidentally, are sometimes the source of considerable trouble. A concrete bridge deck on which there are not ties or ballast requires no waterproofing. Decks of this type are heavily reinforced to carry the loads and are impervious to water without the application of waterproofing. Also, if it is a steel deck and the rail is carried directly on the steel, waterproofing is seldom required.

A still further economy arises by reason of the fact that rails last longer, owing to the perfectly level bearing which can be provided. No chance is given for low joints to develop, while most of the usual twisting and bending stresses are eliminated. For these reasons, there are no disadvantages in laying track directly on steel or concrete decks, without ties or ballast. On the other hand there are advantages in this type of construction, since marked economies in both original cost and maintenance can be realized; the track is exceptionally safe; and the track rides smoothly.

No Hard Spot

By Engineer Maintenance of Way

One of the most common objections advanced to the type of construction described in the question is that it introduces a "hard spot" in the track which may cause discomfort or apprehension to passengers on trains moving at full speed. I take no account of this objection. While I have had no personal experience with the ballastless concrete deck, I have had considerable with steel bridges of varying spans on which the rails were fastened directly to steel floors. We never experienced such difficulty with these bridges. If there was a shock on entering or leaving such a bridge, it was invariably because the trackmen had allowed a low spot to develop at the end of the bridge. But this may happen at any open-deck structure, whether it be a steel span or timber trestle.

Another objection sometimes advanced is that this form of construction breaks the continuity, not of the track but of the track construction. However, this occurs at all open-deck bridges and, therefore, does not inhere especially to this type. Again, it is said that since the track forces are not qualified to care for the maintenance, specially skilled labor will be required. I grant readily the advantage of a continuous track structure which can be maintained by the section forces. Yet, I can see no serious objection to this being done by the bridge gangs, since they must maintain the remainder of the bridge in any event. Anyhow, the amount of track maintenance will be so small as to be of minor importance, provided a satisfactory method of securing the rails is employed.

I can see a distinct advantage in this type of construction where headroom is restricted or where a reduction in the depth of the floor will result in important savings in the cost of other items of construction, such as will be found in grade separations where the only alternative is to make an undesirable track raise. It sometimes happens that there is a limit to the depth to which a street or highway can be depressed. In such cases the ballastless floor may be an easy solution to an otherwise difficult problem. If several streets at short intervals are involved, this advantage of this design may be multiplied several fold.

Question has been raised as to whether an adequate rail fastening can be provided. I can say from personal experience that this can be done on steel floors, although the details are sometimes quite troublesome. As far as concrete decks are concerned, I have built a number of industrial concrete trestles in which the rail is fastened directly on the concrete or rests on plates that are. While the movements over these structures are at low speed, I see no reason to believe that the fastenings cannot be made adequate for any speed. Cer-

tainly there should be no insurmountable difficulty in making them as strong and resistant to traffic forces as a tie plate on a wooden tie. Such questions as cushions, insulation, etc., are mere details which do not affect the principal implication of the question under discussion.

Advantages of Snow-Melting Pits

What are the advantages of snow-melting pits in yards and terminals? Where should they be placed and how should they be constructed? How heated?

Heat with Steam

By Division Engineer

Snow-melting pits are a distinct advantage where snow must be disposed of but where the ordinary methods either cannot be employed or are unduly expensive. I have in mind an interlocking where there was scarcely room to care for the snow accumulations of even minor storms and a heavy snow would have blocked it completely unless some means of disposal could be provided. As the number and importance of the trains were too great to afford an opportunity to load the snow, a melting pit presented the only solution to the problem. Similar situations are sometimes found around transfer platforms, and elsewhere where loading is impracticable and storage for the snow is not available.

Drainage is essential for a snow-melting pit, particularly if a large quantity of snow is to be handled. This can generally be provided at moderate expense, but it is worth while to provide adequate drainage, at considerable expense if this is necessary. A relatively deep pit is better than a shallow one. The area will depend somewhat on the amount of snow to be handled, but should be as large as practicable. It can be constructed of concrete or of creosoted timber. If second-hand bridge timbers are available, the cost will be less.

Obviously, heating is the most important item. Steam coils laid on the bottom and sides will give the best results. In fact, in many cases this will be the only method available. At isolated points the necessary steam can be provided by a locomotive assigned for this purpose.

May Be Economical

By Supervisor of Track

A snow-melting pit will sometimes pay for itself in a single storm, especially where large accumulations of snow must be loaded and hauled away by train. Hand loading is unreasonably expensive and it also costs money to do the loading with mechanical loaders. The cost of hauling and of unloading must also be added, and this may be relatively high. Dump cars are not always readily available when needed for snow loading and more than once I have been compelled to unload one or more trains of snow by hand. In any event, the loading and unloading will tie up a gang that can be used to better advantage elsewhere.

These pits are by no means a cure-all for snow troubles, but almost any large terminal will have one or two points where they will be of considerable advantage. In such cases, if drainage can be provided at reasonable cost, the use of a melting pit may result in considerable economy, as well as be a real convenience. Obviously, drainage is as essential to the successful operation of a melting pit as the proper heating of it. Heating is best accomplished by means of steam coils. There should be as much heating surface as practicable, placed on the bottom as well as the sides and ends. Better results will be obtained from a deep pit than from a shallow one, especially if it is in an exposed windy location.

Such a pit can be constructed of concrete or of creosoted timber. A long narrow pit is better than one that is more nearly square. It should be designed with a cover that can be replaced when the pit is not in use. It is a good idea to have a canvas cover to place over the pit while snow is not being dumped into it, as this will help to retain the heat and accelerate the melting of the snow.

Resurfacing a Concrete Platform

When a concrete station platform settles unevenly, must the uneven portion be replaced or can it be resurfaced? If the latter, how?

Several Methods

By A. T. Hawk
Engineer of Buildings, Chicago, Rock Island & Pacific, Chicago

Much depends on the importance of the platform; a busy suburban platform or one at an important through station will, obviously, receive more attention than one at an unimportant point. Again, the relative location and extent of the defect must be given consideration. If settlement occurs at the extreme end, where the platform is little used, and particularly if it is slight, this will influence the character and extent of the work to be done. A common practice in constructing concrete platforms is to subdivide them into slabs, generally about 6 ft. square, and lay them alternately. For this reason, settlement is most apparent at the corners or along the lines of the joints.

Sometimes only one slab settles, leaving the adjacent slabs at the original level, thus creating a stumbling hazard. At other places adjoining slabs may settle, leaving a comparatively smooth surface, but with a decided dip. Again, the settlement may take place at the corner where four slabs meet, creating a hazard for both pedestrians and trucks. In still other cases, the settlement may occur along the edge of the platform. If this happens along the back edge, it is not so serious as along the track edge, because of the difference in use.

Faulty foundations underlie all settlements. Platforms are usually constructed on fills ranging from a few inches in depth to 20 ft. or more. To avoid settlement, this fill should be well compacted or preferably made of such materials as sand or gravel, which have little shrinkage. Good drainage is also demanded, and a platform should have sufficient crosswise pitch to shed the water to some point where it can be disposed of. A crown of sufficient elevation near the center will give added strength and help to compensate for settlement if it does occur. If the platform is located on a fill which may be expected to settle, it is good practice to install a temporary wooden, gravel of cinder platform for a few years until the fill has become compacted and then install a more permanent form of construction.

If the settlement occurs along the edge of the platform, it can usually be rectified by lifting the depressed

edge of the slabs and ramming cinders, sand or gravel under them to bring them back to surface. If it is along a joint between two slabs, where only one slab is involved, a slight settlement can sometimes be overcome by beveling the edge of the high slab. If at a corner where four slabs meet, it is generally feasible to cut out a small section to permit the insertion of a jack or lever. The slabs can then be raised, material rammed in as already described, and the cut-out section filled with concrete.

Where two adjacent slabs are depressed enough to require resurfacing, they can be raised with a jack or levers and surfaced by means of rammed filling, after which any necessary cut-outs can be replaced with concrete. If the settlement has been severe enough to cause breakage, it is better to remove the damaged slabs and replace them. Bituminous patch-in fillers are sometimes used, but this is usually a temporary expedient as it is extremely difficult to get the patching material to stick to the concrete.

Sometimes a considerable area settles. When the depression is large enough, it may be desirable and economical to place a new slab two or more inches thick, over the original slabs. It is important, however, that proper methods be employed to insure a good bond between the new and old concrete is obtained.

No Defense Can Be Offered

By General Inspector of Buildings

No defense can be offered for settlement in a concrete platform, since it can always be traced to carelessness or lack of judgment, except where the damage occurs from external causes which could not be foreseen or controlled. A concrete platform settles only because its foundation settles first. For this reason, such a platform should be laid only on filling that is well compacted. If the platform is to be placed on an embankment which may be expected to settle, a temporary platform should be laid until settlement is complete, after which the filling directly under the platform should be well rammed before the platform is constructed. Locomotive cinders, sand and gravel are most satisfactory for this purpose. However, settlement does occur in concrete platforms with distressing frequency, in which case repairs must be made.

Where only a few slabs are involved, it is a relatively simple matter to lift them and ram the amount of suitable material, such as cinders or sand, under them, that is needed to bring them back to their original surface. If a slab is broken during or after settlement, it should be removed and replaced. In extreme cases, where such platforms have been constructed on new fills, as in track elevation, the entire platform may settle unevenly. About the only remedy in this case is to keep the platform in as good surface as practicable until full settlement has taken place and then construct a new platform surface on top of the old one, or replace it entirely, if none of it can be salvaged. It pays to take the proper precautions in the first place, for concrete platforms, while highly satisfactory when in good condition, are seldom very satisfactory after they have been resurfaced. A platform that is disposed to settle may be affected over a large portion of its area.

When Is a Pile Overdriven?

How does one determine whether a pile is being overdriven?

Depends on Equipment

By W. J. Howse

Bridge and Building Foreman, New Orleans & North Eastern, Poplarville, Miss.

In general, the indications that a pile is being overdriven will depend to some extent on the type and size of the pile driver employed in the work. If a drop hammer is being used for driving the piles, it will be noted that after every blow there will be a corresponding rebound of the pile as though it might be resting on a coil spring. In some cases, the top of the pile will split, or seem to burst, under the blow. This is generally a sure indication of overdriving.

If a steam hammer is doing the work, the best indication of overdriving is that, while the pile has a rebound something like that under the drop hammer, if a considerable part of its length is above ground, as in a high trestle, it will buckle, and sometimes break, under the blows.

In general, a pile will not rebound in this manner unless it is being overdriven, and this action is most pronounced when the point is becoming battered and broomed by coming in contact with some impenetrable stratum or object. Any pile that does not rebound or show evidence of splitting or severe brooming at the head, is not being overdriven.

Many Piles Damaged

By H. Austill

Bridge Engineer, Mobile & Ohio, St. Louis, Mo.

Several years ago when I was on construction work, the chief engineer issued instructions that in driving piles, the driving be discontinued immediately when the pile struck solid rock. This seemed rather rather ridiculous to several of us. Yet, in many cases, driving actually has been continued after the pile has struck solid rock. In fact, perhaps as many, or it may be more, piles are injured by overdriving as are left unsafe by underdriving.

Following are some of the evidences of overdriving, although unfortunately, in most cases the damage has been done before these become obvious: Irregular penetration under equal fall of the hammer; sudden change in penetration under a blow of the hammer; a movement laterally, or springing or kicking near the ground line; undue bouncing of the hammer (this may occur because the hammer is too light, however); a sudden change of direction by the pile; brooming of the pile head; splitting of the pile; and rebound of the pile, indicating brooming at the point.

Probably the best protection against overdriving is a proper investigation of the soil and underlying strata by borings, sounding rod or other satisfactory means, and the use of a hammer of proper weight for the piles that are to be driven.

It Is Difficult to Tell

By G. A. Haggander

Bridge Engineer, Chicago, Burlington & Quincy, Chicago

Piles are not usually overdriven in ordinary driving where the bearing of the pile is the determining factor. On the other hand, overdriving is more likely to occur when penetration is the governing factor and certain penetrations are required regardless of the supporting power of the pile. Overdriving is usually due to some weakness in the head of the pile, which causes brooming, splitting or the breaking-up of the head. When any of these occur, there is no question that the pile is being overdriven. Further penetration can sometimes be

secured by banding the head or by cutting off the damaged portion and reheading it, and then again driving it until further damage occurs.

Ofttimes the damage occurs at the point of the pile, owing to the fact that it cannot penetrate heavy gravel, shale or rock. In these cases, penetration is stopped for a short time, but under a powerful hammer the point begins to broom and the head of the pile continues to go down, although no further penetration is being obtained.

I have seen many cases where several feet of the points of the piles were badly damaged in this way. It is difficult to tell exactly what is going on at the point unless the character of the soil is known and the pile is watched carefully when it stops and later when it resumes its downward movement as a result of the brooming action at the point.

Single and Multi-Stage Pumps

What is the difference between a single-stage and a multi-stage pump? Under what conditions should each be used?

More Stages, More Head

By J. T. Andrews
Assistant Engineer, Baltimore & Ohio, Baltimore, Md.

In effect, the multi-stage pump is merely two or more single stages arranged in series, so that instead of a single impeller on a shaft there are two or more. In present-day practice these are usually enclosed in a single casing. As the purpose to be accomplished is to transfer the energy of the water, on being discharged from the impeller, from velocity to pressure, the latter increases about proportionately with the number of stages, so that with an increase in the number of impellers, or stages, the water can be discharged against a correspondingly higher head.

As the single-stage pump is of simpler design and requires less maintenance than the multi-stage type, as well as being cheaper in first cost, it should be used wherever the pressure head against which it must work is fairly low. The practicable limit is often assumed to be about 150 lb., although with high-speed operation, many single-stage pumps now on the market can operate efficiently at much higher heads. For an average normal operation, however, where the power unit is a direct-connected motor, operating at, say, 1,750 r.p.m., it is conservative practice to set the maximum head against which single-stage pumps will operate at about 150 ft. For heads greater than this, it is better to use multi-stage pumps, the number of stages being roughly proportional to the increase in head.

This will permit the use of single-stage pumps for by far the greater number of water stations. Multi-stage pumps can be used at stations where the water must be delivered through long pipe lines or against high static heads; for boiler-feed pumps against high pressure; for fire pumps, or as boosters where it is necessary to build up heavy pressures. It is also customary to use multi-stage pumps for deep wells, where heads are high. But as efficiencies are generally low in these operations, the approximate figure of 150 ft. per stage must be reduced somewhat.

The Number of Impellers

By C. R. Knowles
Superintendent Water Service, Illinois Central, Chicago

As applied to centrifugal pumps, the term stage indicates the number of impellers. Thus a single-stage pump has one impeller; a two-stage pump, two; and so on to any number of stages. In centrifugal pumps the impellers impart velocity to the stream of water as it passes through, but as the water leaves the impeller the energy thus imparted to it is changed to pressure. Since there is a limit to the velocity, or pressure, which a single impeller can impart, the purpose of additional stages is to increase the pressure for operation against high heads. For example, deep-well turbines are sometimes provided with as many as 14 to 16 impellers and 8 to 12-stage deep-well pumps are not at all uncommon.

In general, the condition under which a single or a multi-stage pump should be used depends entirely on the discharge pressure that is desired. A single-stage pump is ample for the heads ordinarily encountered in railway water service, since modern centrifugal pumps are so designed that a very satisfactory efficiency can be obtained at heads up to 200 ft. or even more. The use of multiple-stage pumps in railway water service is, therefore, confined largely to vertical, deep-well turbines, fire protection and boiler washing.

Reports on Two Motor-Car Accidents

TWO serious motor-car accidents, both head-on collisions with trains, and both of which are stated to have been caused by carelessness and complete disregard of operating rules issued for the protection of motor cars, have been made the subject of reports by the Bureau of Safety of the Interstate Commerce Commission.

In the first, which occurred on the Camas Prairie, near Lewiston, Idaho, on August 1, the operator, a bridge and building carpenter, was killed and a car inspector was injured. The evidence showed that the car and operator had been assigned to take the inspector to various outlying points for the purpose of inspecting cars for grain loading. On the return trip the operator failed to get a line-up of trains as he passed through Lewiston, although he removed the car from the track and is supposed to have gone to the dispatcher's office. He then proceeded toward East Lewiston and collided with a regular passenger train on a sharp curve where the view was limited. The conclusion of the commission is that the accident was caused by the operation of a motor car on the time of an opposing over-due train without authority or protection.

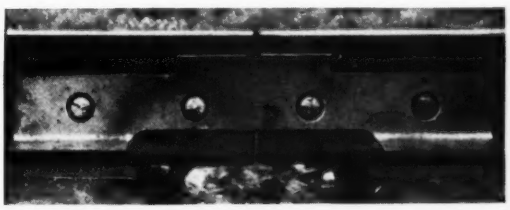
The second accident, which occurred on the Chesapeake & Ohio, near Pemberton, Va., on September 9, resulted in the injury of four trackmen. The evidence indicated that the two section gangs involved, totaling 2 foremen and 11 trackmen, had been at a washout where they were on duty continuously for 31 hours. When relieved, they started to return to their headquarters on the car of one of the foremen, who assumed responsibility for the operation of the motor car.

The other foreman obtained for him a line up of trains on the prescribed form, which indicated that two opposing trains, the first a scheduled freight and the other a regular passenger train, were due shortly at the next station. However, this information was ignored as was also the rule that motor cars must not pass open telegraph offices without ascertaining the location of trains and the further rule that motor cars must not be operated on the time of scheduled trains without flag protection, and the car passed the first station and collided with the train 1.2 miles beyond.

New and Improved Devices

Three-Point Restoration Shim

FOLLOWING four years of service tests, the Rail Joint Company, New York, has placed on the market a joint restoration shim, designed to compensate for the wear in both the head and base fishings of the rail and in the joint bars themselves. Through the new shims, which are known as Three-Point Restoration shims because they take into account the three points of greatest wear at joints, it is contended that the take-up at joints is restored, the life of the bars is prolonged, and the track surface at joints is improved. It is said that if shims are applied two to four weeks ahead of the building up of battered rail ends, the saving in the building-up cost more than justifies the expense.



One of the Three-Point Shims in Position, Ready for the Re-Application of the Joint Bars

The shims, made in three uniform thicknesses, 1/32 in., 3/64 in., and 1/16 in., to meet various degrees of wear, fit against the fishing of both the rail head and base, and thus compensate for the wear along both of these surfaces, as well as along the top and base of the joint bars. Made so that they will adjust themselves to conform to the irregularities of wear at the points of greatest compression, shims of these three thicknesses have been found to meet practically all wear conditions. The shims are adapted for use with angle bars, or with base-supported, head-contact or headfree joint bars with either four or six holes. Shims 24 in. long are said to be satisfactory for use with joints up to and including 31 in. in length. When installing the shims, it is intended that the bars on the opposite sides of a joint be reversed.

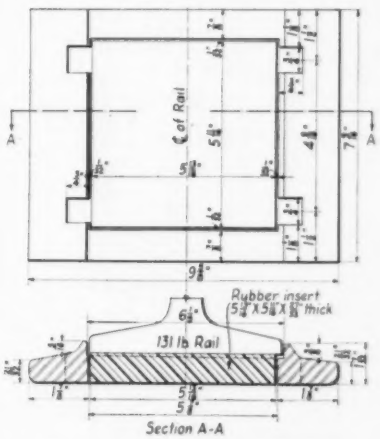
Application of the shims to 90-lb. rail with 31-in. 6-hole angle bars on one road is said to have so restored the surface at the joints that there was a reduction of 42 per cent in the length of the welds considered necessary. On another road, where 130-lb. continuous headfree, four-hole joint bars were involved, the application of the shims is said to have reduced the length of rail-end welds approximately 38 per cent.

Study Properties of Rubberized Tie Plates

WITH a view to applying the cushioning properties of rubber to railroad track in such a manner as to minimize the vibration of equipment, lessen mechanical wear of the ties, rail and equipment and reduce the noise made by the wheels of rolling stock, a composite design of plate has been developed which involves the use of both rubber and metal in such a manner that the rubber transmits the load from the rail to the tie while the metal portion holds the track to gage and acts as a housing for the rubber.

An installation of 1,000 tie plates of this type has been in service in a high-speed, heavy-traffic express track of the Chicago Rapid Transit Lines since 1931 where it is reported that the rubber is still as resilient as when installed. Four hundred of these plates have also recently been placed under 130 lb. rail in a main track of the Pennsylvania, carrying heavy traffic west of Altoona, Pa.

The type of plate employed in these installations, which is known as the Osborn tie plate and is manufactured by the B. F. Goodrich Company, Akron, Ohio, consists of a double-shoulder, four-hole steel tie plate of conventional shape, except for the fact that a rectangular hole, occupying a large proportion of the space between the shoulders, is provided through the plate, in which a slab or pad of rubber is inserted. The thickness of the rubber slab is about 1/16 in. greater than the depth of the tie plate; thus the rail does not come into contact with the tie plate except at the shoulders and the load on the rail is transmitted directly through the rubber to the tie. The principal functions of the steel portion of the plate are to confine the rubber in such a manner as to build up resistance against vertical deformation as the load increases and to take lateral thrust through the shoulders.



Design for a Rubberized Tie Plate

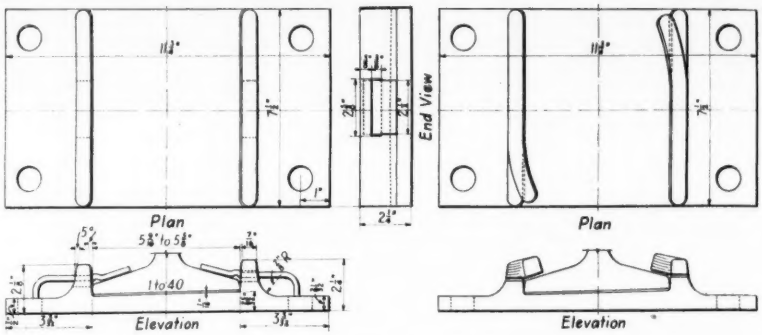
In the accompanying drawing is shown an Osborn "rubberized" tie plate designed for use with 131-lb. rail. With this design, the bearing area between the rail and the rubber amounts to 32.5 sq. in.; thus, with a coefficient of friction between steel and rubber of about 0.6, it is pointed

out that there is little likelihood of the rail sliding on the rubber when lateral thrusts are encountered or when the rail is subjected to longitudinal forces.

As it is highly non-compressible, comparing in this respect with water, rubber changes in shape only and not in volume when subjected to compressive stresses. Therefore, in order to prevent the rubber pad from lipping over the edges of the cavity under load, the cavity is made about 1/16 in. greater in length and width than the rubber pad, thus allowing the latter to expand within the tie plate as it deflects vertically under load. Hence as the load is applied the rubber tends to fill the cavity and to build up resistance against the confining walls. Because of this feature the load-deflection curve of the rubber slab used in the cavity indicates that, while the vertical deformation of the rubber under a load of 5,000 lb. is 0.16 in., the compression under a load of 30,000 lb. is only 0.25 in.

It is pointed out that rubber used in a tie plate of this type should be of a good quality, as aging and repeated loading tend to cause the material to acquire a permanent set. That the rubber used in the Osborn tie plate retains its resiliency under load is indicated by the results of a loading test made on 6-in. by 7-in. slabs of the rubber about ½ in. thick in which the decrease in thickness was taken at six different loads up to 40,000 lb. In each case it was found that on release of the load the rubber recovered its original thickness.

An important advantage claimed for the Osborn type of tie plate is that it reduces the mechanical wear.



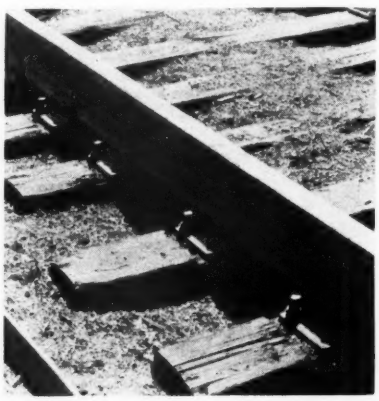
Two Designs of Woodings Tie Plates for 112-lb. R. E. Rail

Two New Designs for Tie Plates

THE Woodings Forge & Tool Company, Verona, Pa., has announced two different designs of tie plates, which represent a further development of the trend toward holding the plate rigidly to the tie independently of the rail fastening. Both designs are identical in section, but differ in the method employed to fasten the rail. Both have double shoulders which extend about 1¼ in. above the rail seat, and both designs are fastened rigidly to the tie by means of lag screws which do not function as fastenings for the rail.

In the first design the opposite ends of the two shoulders are sheared for about 2½ in. at a level 3/16 in. above the top of the rail base, so that after the plates are applied the slit end of each shoulder can be bent inward to hold the rail in place. A special tool is provided for this purpose, which limits the bend and insures the proper clearance between the bent portion of the shoulder and the rail base, thus allowing ample room for the wave motion of the rail.

It is said that experience has demonstrated that the shoulder of these plates can be bent about 50 per cent faster than the corresponding number of track spikes can be driven, and that they will withstand repeated bending through the angle necessary to serve as an effective rail fastening. For this reason, the plates can be removed and reapplied without damage as often as may be necessary in connection with tie and rail renewals.



Woodings Slit-Shoulder Tie Plates

In the second design, the shoulders have slots 2⅜ in. wide and ⅜ in. deep, symmetrical about the center line of the plate, the bottom of the slot being approximately at the elevation of the outer edge of the rail base. To hold the rail in place, a flat high-tension clip-shaped spring, 2½ in. wide, is inserted through the slot. The outer end of the spring is turned down to bear on the top of the tie plate, while the opposite end is shaped to bring a flat surface to bear on the top of the base of the rail.

Since the top of the slot is lower than the greater part of the bearing area on the rail base and is also slightly below the upper portion of the outer bent section when the spring is driven into place, considerable pressure is exerted on the rail base; yet it is said that the spring permits a small amount of vertical movement in the rail relative to the tie and tie plate, but exerts marked resistance to longitudinal movement. The spring is provided with a rib which, when it is in place, lies inside of the shoulder of the tie plate, and thus prevents backing out.

Both of these designs can be rolled to any desired width, length or thickness. The first design is made of mild open-hearth steel; the second can be of either low or medium carbon steel as desired. The bottoms are flat, since the lag-screw fastenings insure against movements of the plate relative to the tie. The rail seat may be flat or canted and with or without camber. If camber is desired, it is provided by a rolled-in crown.

Woodings Spring-Clip Tie Plates

In stallations have been made or are in progress on the Illinois Central; the Missouri Pacific; the Chicago, Milwaukee, St. Paul & Pacific; the Wheeling & Lake Erie and the Pennsylvania. The illustrations were made from photographs of the installation on the Illinois Central at Paxton, Ill.

News of the Month . . .

Approves Additional Grade Crossing Plans

In line with the administration's program to increase employment on public works projects as rapidly as possible, the President, during November, continued to approve programs submitted by the various states for the elimination of grade crossings, which will be financed from the $200,000,000 fund previously allocated for this purpose. Up to November 16, the President had approved plans for grade crossing eliminations submitted by 37 states and the District of Columbia, which call for a total expenditure of $26,561,000. Up to the same date contracts for grade separations had been awarded totalling $9,199,524, while during the week ending November 16, contracts for projects totalling $1,691,540 were awarded in 11 states.

New Railroad Retirement Board

The personnel of the new Railroad Retirement Board, which was created by the passage of the railroad pension act by Congress in August, was announced by President Roosevelt on October 30. Murray W. Latimer has been appointed chairman of the board, while Lee M. Eddy and James A. Dailey have been appointed members. Mr. Latimer was chairman of the board that was created under the former pension law and which was declared unconstitutional by the United States Supreme Court last May. Mr. Eddy was also a member of the former board, having been nominated by the railroad labor organizations, while Mr. Dailey, who has been secretary of the board of pensions of the New York Central Lines, was nominated by the railroads. He replaces John T. Williamson, chairman of the pension board of the Chicago, Burlington & Quincy, who served in the capacity of railroad representative on the old board.

A.A.R. Meets at Chicago

On November 7-8 the Association of American Railroads held its first annual meeting since its formation about a year ago by the consolidation of various railroad organizations including the Association of Railway Executives and the American Railway Association. Major action taken at the meeting, which was held at Chicago, included a recommendation that the installation of collection and delivery of merchandise freight locally, jointly and between different freight territories be put in effect as soon as possible; instructions to the railroads' legal departments to study the railroad retirement act of 1935, which becomes effective on March 1, 1936, with a view to contesting its constitutionality if this appears advisable; a recommendation that the various rate organizations proceed to revise the rate structure on merchandise freight with a view to meeting truck competition; and instructions to the officers of the association to proceed and press the unification of terminals to a conclusion so far as possible.

New Livestock Shipping Plan Regains Traffic

The introduction in 1933 by certain railroads of a new plan for shipping livestock, known as the any-quantity livestock shipping plan, has been effective in combating competition on the highways for this class of traffic, said H. D. Timberlake, traffic manager of the East St. Louis Junction, in a recent address. Under this plan individual farmers and stock feeders may ship livestock in any quantity, whereas, previously shipments of only carload lots were accepted. The any-quantity plan was first established on 181 miles of the Missouri Pacific, where 25 stations were served. Subsequently, it was extended over 1,340 miles of line serving 380 stations, and has also been adopted and widely applied by the Missouri-Kansas-Texas and the St. Louis-San Francisco. During the time that the plan has been in operation more than 2,500 cars of livestock have been handled into the National Stockyards, St. Louis, alone, according to Mr. Timberlake. At present the any-quantity plan is in effect only one day each week.

R.F.C. Head Discusses the Railroad Problem

"Renewed ability on the part of the railroads to earn and spend for supplies, betterments, equipment, etc., would have a far reaching effect in improving business in all lines," said Jesse H. Jones, chairman of the Reconstruction Finance Corporation in an address before the recent convention of the American Bankers Association at New Orleans, La. In discussing the railroad problem from various angles Mr. Jones said that he holds "no particular brief for the railroads, but they are entitled to a fair deal by the public, as well as by our legislators; also from their competitors in other forms of transportation." He dwelt quite at length on future trends in transportation and said that the "time has come when transportation should be treated as a unit, including in that unit, railroads, waterways, highways, and airways." In view of increasing competition in transport, he continued, it must be admitted that we cannot support all railroad mileage; therefore there should be consolidations and eliminations of unprofitable mileage. He pointed out that in order to put the railroads in condition to handle any substantial increase in traffic much new capital would be needed, which, he said, in all probability would have to be furnished through government agencies such as the R.F.C.

Rail Employment Up Slightly in October

The number of employees of Class I railroads as of the middle of October was 1,016,714, as compared with 1,011,683 in October, 1934, an increase of 0.5 per cent, according to reports compiled by the Bureau of Statistics of the Interstate Commerce Commission. This is the first time since December, 1934, that the number of railway employees in any month has shown an increase as compared with the corresponding month of the previous year. As compared with the previous month, the number of employees in October of this year showed an increase of more than 8,000, or 0.8 per cent. With adjustments for seasonal variations the number in October represented 55.4 per cent of the average for 1923-25.

New Maps Show All Transportation Arteries

A set of large-scale maps showing all details of existing transportation systems in Iowa has been prepared by the Bureau of Public Roads of the U. S. Department of Agriculture in co-operation with the U. S. Geological Survey. The maps are on a scale of 4 miles to the inch. The set consists of 8 sheets approximately 26 in. by 36 in. so arranged as to permit binding on the left margin, and shows in color the location and character of practically all transportation arteries such as the federal-aid and state highway systems, important secondary highway connections, air lanes and landing fields, railroads, pipe lines, navigable channels and canals. Iowa is the first state for which such transportation maps have been prepared. Sets of the maps are obtainable by purchase from the Superintendent of Documents, Washington, D.C., at $1.75 per set.

Yucatan Railways Now Operated by Employees

Following a dispute involving wages and working conditions, the United Railways of Yucatan have been turned over to its workers for management. The Union of Railroad Workers called a strike on October 2 and following several unsuccessful meetings with stockholders, the government of Yucatan intervened and decided that the road should be turned over to the workers. Under the

arrangement, stockholders will be at liberty to elect commissioners but the labor union will appoint the members of the board of directors, the director, the treasurer, the superintendent of shops and other officers whom the union may designate. The government of Yucatan reserves the right to make any suggestions it may deem advisable to the board of directors. The arrangement will continue until the new management decides whether the demands and charges made by the workers are justified.

Santa Fe Diesel Catches Fire on Test Run

A potential new speed record by rail between Chicago and Los Angeles was thwarted on November 20 when the forward unit of the 3600-hp. Diesel locomotive which was pulling the new "Superchief" of the Atchison, Topeka & Santa Fe on a test run between these points caught fire near Gallup, N. M. No one was injured seriously and the trip to Los Angeles was completed behind steam power. The run was being made preparatory to establishing a regular reduced schedule between Chicago and the Pacific Coast. The speed from Chicago to Kansas City, 451 miles, had averaged 65 miles an hour; from Kansas City to La Junta, 540 miles, the average was 65 miles an hour; from La Junta to Gallup, 509 miles in mountainous territory, the average had been 50 miles an hour. The speed was limited to a maximum of 98 miles an hour, which repeatedly had been approached for long distances. President Bledsoe said that the accident to the Diesel would not stop the railroad's determination to inaugurate at an early date Diesel engine fast service between Los Angeles and Chicago.

Rail Net Shows Increase for September

The Class I railroads of the United States had a net railway operating income of $321,994,682 for the first nine months of 1935, which was at the annual rate of return of 1.70 per cent on their property investment, according to reports compiled by the Bureau of Railway Economics of the Association of American Railroads. In the first nine months of 1934, their net railway operating income was $344,585,784, or 1.81 per cent. Operating revenues for the first nine months of this year totaled $2,511,921,427, as compared with $2,464,173,008 for the same period last year, an increase of 1.9 per cent. Operating expenses amounted to $1,916,671,363, compared with $1,835,085,595 for the same period in 1934, an increase of 4.4 per cent.

For September these roads had a net railway operating income of $57,359,339 or 1.89 per cent, as compared with $41,713,425, or 1.37 per cent, in September, 1934. Operating revenues for September amounted to $306,960,214, as compared with $275,539,656 in the same month last year, an increase of 11.4 per cent. Operating expenses totaled $218,040,299, as against $203,220,059 in September, 1934, an increase of 7.3 per cent.

Association News

Bridge and Building Association

President Strate has sent a letter to members inviting volunteers for committee work. At a meeting in Chicago on December 14, the Executive committee will appoint the members of the committees that are to prepare reports on current problems for presentation at the next convention.

Roadmasters Association

The Executive committee will meet in Chicago on December 7 to select members of committees to investigate and prepare reports for presentation at the next convention on the subjects selected at the last convention. Report will also be received at that time from the committee appointed to select hotel headquarters for the next meeting.

Maintenance of Way Club of Chicago

Fifty-five members and guests attended the dinner on November 20, when the subject for discussion was the preparation for and fighting of snow and sleet storms. Papers were presented by G. M. O'Rourke, district engineer, Illinois Central, and R. A. Sheets, signal and electrical engineer, Chicago & North Western. The next meeting of the club, which will be designated as roadmaster's night, will be held on December 18, when a number of roadmasters will lead the discussion on a series of questions relating to practical track problems.

International Railway Maintenance Club

Ninety-nine members and guests attended a meeting on November 21, at Niagara Falls, N. Y. As guests of T. E. Akers, vice-president of the Ramapo Ajax Corporation and president of the Canadian Ramapo Iron Works, Ltd., the group assembled at the Ramapo plant at Niagara Falls about noon for a brief inspection of the plant and of Ramapo products, and then was entertained at luncheon at the Niagara Falls Country Club. After luncheon, the meeting was addressed extemporaneously by several speakers, including J. V. Neubert, chief engineer maintenance of the New York Central system.

Metropolitan Track Supervisors' Club

Eighty-eight members and guests attended a meeting at the Hotel Manger, Boston, Mass., on November 21. Leaving New York City for the first time in the history of the club, the meeting attracted a large audience from the New England roads, including most of the chief maintenance officers. Following an inspection of the North Station terminal area of the Boston & Maine in the afternoon, and dinner at 6:30 p.m., the meeting was addressed by W. J. Backes, chief engineer of the Boston & Maine, and by T. G. Sughrue, division engineer of the Terminal division. Mr. Backes, who was elected an honorary member of the club, welcomed the meeting to Boston and described some of the newer maintenance practices of his read. Mr. Sughrue, supported by large detailed wall plans and lantern slides, described the extensive North Station terminal project which was completed a few years ago.

American Railway Engineering Association

With eight complete committee reports in the hands of the secretary, seven of which have already been sent to the printer, it is anticipated that the first bulletin to contain reports of committees for presentation at the convention in March will be mailed to the members during the first week in December, while others will follow at intervals of a few weeks.

The Board of Direction will hold a meeting at the Shoreham hotel, Washington, D.C., on December 5, and will meet with the executive officers of the Association of American Railroads at luncheon.

Committee meetings held during the month of November for the purpose of taking final action on reports included those of the committees on Shop and Locomotive Terminals, at St. Paul, Minn., on November 4 and 5; Buildings, at Chicago, on November 7 and 8; the Special Committee on Complete Roadway and Track, at Chicago, on November 7; Waterways and Harbors, at Chicago, on November 12; Track, at Chicago, on November 14; Economics of Railway Labor, at Columbus, Ohio, on November 20; Iron and Steel structures, at Columbus, Ohio, on November 22; Rail, at New York, on November 24; and Records and Accounts, at Cleveland, Ohio, on November 26. The meeting of the Committee on Economics of Railway Labor was followed by an inspection trip over the Norfolk & Western.

Two meetings are scheduled for the month of December, namely, that of the Committee on Economics of Railway Operation, at Chicago, on December 5; and of the Committee on Water Service, Sanitation and Fire Protection, at New York, on December 6.

National Railway Appliances Association

At a meeting of the board of directors at Chicago, on October 25, following the death of C. W. Kelly, secretary-treasurer, C. H. White, district sales manager of the Industrial Brownhoist Corporation, with headquarters at Chicago, and vice-president of the association, was elected secretary and director of exhibits; and W. Homer Hartz, president-treasurer of the Morden Frog & Crossing Works, with headquarters at Chicago, and honorary director of the association, was elected also treasurer. T. O'Leary, Jr., sales manager of the transportation depart-

ment, western division, Johns-Manville Sales Corporation, with headquarters at Chicago, continues as president.

With more than thre months to go before the opening of the association's exhibit of materials and equipment employed in the construction and maintenance of railway track, structures and signals at the Coliseum, Chicago, on March 9-12, 1936, inclusive, concurrently with the annual conventions of the American Railway Engineering Association and the Signal Section, A.A.R., a total of 62 railway supply companies have been awarded space in the exhibit hall. These companies have contracted for a total of 133 spaces, or more than 19,500 sq. ft. of exhibit space.

The supply companies that have already been awarded space for exhibits are as follows:

Adams & Westlake Company
Air Reduction Sales Company
American Car & Foundry Company
Armco Culvert Manufacturers Assn.
Austin-Western Road Machinery Company,
Barco Manufacturing Company
The Barrett Company
Bethlehem Steel Company
Binks Manufacturing Company
The Buda Company
Chicago Pneumatic Tool Company
Cleveland Frog & Crossing Company
Conley Frog & Switch Company
Crerar, Adams & Co.
Cullen-Friestedt Company
Dearborn Chemical Company
DeSanno & Son, A. P.
Paul Dickinson, Inc.
Dpff-Norton Manufacturing Company
Eaton Manufacturing Company
Evans Products Company
Fairbanks, Morse & Co.
Fairmont Railway Motors, Inc.
Gould Storage Battery Company
Hayes Track Appliance Company
Industrial Brownhoist Corporation
Ingersoll-Rand Company
Kerite Insulated Wire & Cable Company
Johns-Manville
O. F. Jordan Company
Kalamazoo Railway Supply Company
The Lehon Company
Locomotive Finished Material Company
Magnetic Signal Company
Maintenance Equipment Company
Mall Tool Company
Metal & Thermit Corporation
Morden Frog & Crossing Works
National Carbide Sales Company
National Carbon Company
National Lock Washer Company
The Nordberg Manufacturing Company
The Okonite Company
Pocket List of Railroad Officials
Oxweld Railroad Service Company
Pomona Pump Company
Pyle-National Company
O. & C. Co.
Racor Pacific Frog & Switch Company
The Rail Joint Company
Railroad Accessories Corporation
Railway Purchases & Stores
Railway Track-Work Company
Ramapo Ajax Corporation
Republic Steel Corporation
Sellers Manufacturing Company
Simmons-Boardman Publishing Company
Syntron Company
Templeton Kenly & Co.
U. S. Wind Engine & Pump Company
Western Railroad Supply Company
Youngstown Sheet & Tube Company

Personal Mention

General

W. S. Higgins, division engineer of the Victoria division of the Southern Pacific Lines in Texas and Louisiana, has been appointed superintendent of this division, with headquarters as before at Victoria, Tex.

Edward M. Durham, Jr., an engineer by training and experience, has been appointed chief executive officer of the Chicago, Rock Island & Pacific, in full charge of all departments, with headquarters at Chicago. Mr. Durham has been senior executive assistant of the

Edward M. Durham, Jr.

Missouri Pacific since the appointment of trustees for that company in 1933, prior to which time he was senior vice-president. A native of Memphis, Tenn., Mr. Durham was born on October 23, 1875, and was educated at Lehigh university, from which he graduated in 1898. An engineer by training, Mr. Durham spent several years in the pursuit of his chosen profession before entering active railroad service. In 1896-97 he was engaged with the United States War department on hydrographic surveys on the Ouachita river, following which he served for several years as recorder for the Deep Waterways Commission of the State of New York. Mr. Durham entered railway service in 1899, as a transitman with the Chicago & North Western, leaving this company in the following year to go with the Southern as an assistant engineer. With this company he was promoted successively through the positions of resident engineer, pricipal assistant engineer, assistant chief engineer, and chief engineer. While connected with the Southern, Mr. Durham also served for two years as valuation engineer of the Atlanta, Birmingham & Atlantic (now the Atlanta, Birmingham & Coast) and as executive general agent of the Southern. In 1920, Mr. Durham joined the United States Railroad Administration as manager of the department of way and structures, being appointed director of the division of liquidation claims in 1923. In 1924 he returned to railway service as assistant to the president of the Missouri Pacific, being appointed vice-president of this line in 1926. He was made senior vice-president in the following year.

J. D. Morris, supervisor of track on the Middle division of the Pennsylvania, with headquarters at Newport, Pa., has been assigned to special duty in the office of the vice-president and comptroller at Philadelphia, Pa. **P. D. Fox,** assistant supervisor on the Middle division, has also been transferred to the office of the vice-president and comptroller.

J. P. Jackson, roadmaster on the Norfolk division of the Norfolk & Western, with headquarters at Lynchburg, Va., effective October 1 was promoted to assistant superintendent in charge of maintenance of way on the Shenandoah division, with headquarters at Roanoke, Va., where he succeeds **J. W. Thomas,** who was appointed assistant trainmaster-roadmaster on the construction of the new line into Grundy, Va. Effective November 1, **O. M. Dawson,** assistant superintendent in charge of maintenance of way on the Radford division, with headquarters at Roanoke, was transferred to the Scioto division, with headquarters at Portsmouth, Ohio, to succeed **W. L. Anglin,** who was transferred to Roanoke, replacing Mr. Dawson.

Engineering

William Elmer, special engineer on the staff of the chief engineer of the Pennsylvania, retired from active duty on November 1.

H. L. Bell has been appointed division engineer of the Victoria division of the Southern Pacific Lines in Texas and Louisiana, with headquarters at Victoria, Tex., succeeding **W. S. Higgins,** whose promotion to superintendent is noted elsewhere in these columns.

E. D. Flad, division engineer of the Eastern division of the Pennsylvania, with headquarters at Pittsburgh, Pa., has been appointed acting engineer maintenance of way, Southern General division, with headquarters at Wilmington, Del., succeeding **R. P. Graham,** who has been granted an indefinite leave of absence because of ill health.

Track

Wayne Norman, a track supervisor on the Chicago, Burlington & Quincy, has been promoted to roadmaster, with headquarters at Sioux City, Iowa, succeeding **R. Hurlbut,** who has been transferred to Greybull, Wyo., to replace **J. L. Baker,** who has been transferred to Wymore, Neb., where he succeeds **W. W. Weckworth,** who has been assigned to other duties.

A. E. Causey, an assistant engineer on the Chicago, Rock Island & Pacific at Dallas, Tex., has been appointed acting roadmaster, with headquarters at Amarillo, Tex., succeeding **C. J. Gardner,** who has been transferred to Liberal,

Kan., where he replaces **M. B. McAdams. J. T. Fitzgerald,** assistant engineer at Ft. Worth, Tex., has been promoted to roadmaster, with headquarters at Topeka, Kan., where he replaces **H. O. Sinsabaugh,** deceased.

D. W. Loftus has been appointed roadmaster on the Chicago, Milwaukee, St. Paul & Pacific, with headquarters at Channing, Mich., to succeed **H. Lindeman,** whose death is noted elsewhere in these columns.

P. M. Roper, supervisor in the office of the vice-president, operation, of the Pennsylvania at Philadelphia, Pa., has been appointed supervisor on the Middle division, with headquarters at Newport, Pa., succeeding **J. D. Morris,** who has been assigned to special duty in the office of the vice-president and comptroller, as noted elsewhere in these columns.

John F. Sinclair, section foreman on the Allandale division of the Canadian National, has been appointed acting roadmaster on the Hornepayne division at Hornepayne, Ont., succeeding G. Erickson, who is on leave of absence because of injuries. **H. J. May,** section foreman on the Port Arthur division with headquarters at Warroad, Minn., has been appointed acting roadmaster on the Dauphin division, succeeding **W. J. Marchen,** retired.

F. P. Pelter, assistant roadmaster on the Norfolk & Western, with headquarters at Williamson, W. Va., has been promoted to roadmaster, with headquarters at Wilcoe, Va., succeeding **H. S. Shanklin,** who has been transferred to Lynchburgh, Va., where he succeeds **J. P. Jackson,** whose promotion to assistant superintendent is noted elsewhere in these columns. **J. W. Goodman,** a transitman at Roanoke, Va., has been promoted to assistant roadmaster at Williamson, to replace Mr. Pelter. These changes became effective on October 1.

Martin L. Wheatley, acting supervisor of track on the Illinois Central, who has been promoted to supervisor of track, with headquarters at Central City, Ky., as noted in the November issue, was born on August 28, 1895, at Litchfield, Ky. Mr. Wheatley entered the service of the Illinois Central in August, 1913, as an extra gang laborer, being promoted to assistant foreman of an extra gang on September 1, 1914. On March 1, 1915, he was further advanced to extra gang foreman and on March 1, 1932, he was appointed yard foreman at Paducah, Ky. Since September 6, 1935, Mr. Wheatley had held the position of acting supervisor of track at Central City.

Joseph Larkoski, section foreman on the Chicago, Milwaukee, St. Paul & Pacific, who has been appointed roadmaster, with headquarters at Madison, S.D., as noted in the November issue, was born on August 7, 1892, at Owatonna, Minn. Mr. Larkoski entered the service of the Milwaukee on July 28, 1906, as a section laborer, being promoted to section foreman on the Iowa & Minnesota division in June, 1911. He held this position at various points until his recent promotion except during 1915-17 when he served as a fence gang foreman and extra gang foreman and during 1934 when he held the position of assistant extra gang foreman on a system ballast and tie gang working on the Chicago & Milwaukee division.

J. A. MacDonald, acting roadmaster on the Kenora division of the Canadian Pacific, has been appointed roadmaster on the Portage division with headquarters at Lauder, Man., succeeding **N. O. Erlandson,** who has been transferred to the Brandon division with headquarters at Minnedosa, Man. Mr. Erlandson succeeds **C. H. Johnston,** who has been transferred to Brandon, Man., to succeed **T. M. Fraser,** retired.

John McNulty, roadmaster on the Chicago, Rock Island & Pacific, with headquarters at Waterloo, Iowa, who retired on September 30, as noted in the November issue, was born on May 16, 1864, at Newark, N.J. Mr. McNulty first entered railway service on August 1, 1879, with the Illinois Central, serving as a section laborer and section foreman until February, 1884, when he went with the Rock Island as a timekeeper at Dows, Iowa. Later Mr. McNulty served as a section laborer and extra gang foreman and in March, 1885, he was made a section foreman, in which capacity he served at various points for the next 15 years. In June, 1900, Mr. McNulty was promoted to roadmaster at Garner, Iowa, being transferred to Iowa Falls, Iowa, in March, 1902. Since May, 1906, he had served as roadmaster at Waterloo.

Bridge and Building

J. B. Teaford, supervisor of bridges and buildings on the Southern, with headquarters at Louisville, Ky., retired on pension on September 30.

Obituary

W. F. Nichols, general foreman on the Lehigh Valley at Buffalo, N. Y., and, prior to July, 1932, supervisor of track on this road at Delano, Pa., and Buffalo, died on October 30.

H. Lindeman, roadmaster on the Chicago, Milwaukee, St. Paul & Pacific at Channing, Mich., died on November 19. Mr. Lindeman was born in 1870, and entered the service of the Milwaukee on May 1, 1886, as a section laborer. Subsequently, he was promoted to extra gang foreman in which capacity he supervised the construction of numerous yards in the mining region in Michigan. He was promoted to roadmaster, with headquarters at Channing, in 1912, which position he held until his death.

J. Pruitt, supervisor of track on the Illinois Central, with headquarters at Central City, Ky., who died on September 28, as noted in the November issue, was born on June 17, 1872, in Grayson County, Ky. Mr. Pruitt entered the service of the Illinois Central on May 14, 1887, as a section laborer and was promoted to section foreman on January 12, 1900. On November 20, 1913, he was further promoted to supervisor of track, which position he held at the time of his death.

Harry G. Clark, an engineer by training and experience, who has been executive assistant to the trustees of the Chicago, Rock Island & Pacific since the appointment of trustees in 1933, prior to which time he was vice-president, died on November 12 at his home in a suburb of Chicago. Mr. Clark had been in rail-

Harry G. Clark.

way service continuously for 37 years. He was born on July 8, 1875, at Leavenworth, Kan., and was educated in civil engineering at the University of Kansas, from which he graduated in 1898. He entered railway service on September 15, 1898, as a chainman on the Atchison, Topeka & Santa Fe. After a short period of service with the Santa Fe, he left this company to go with the Chicago, Burlington & Quincy, serving as a rodman on construction and a transitman on location. In 1900, Mr. Clark became resident engineer on the Western division of the Choctaw, Oklahoma & Gulf (now part of the Chicago, Rock Island & Pacific), later serving as division engineer of the same division. Later Mr. Clark served also as division engineer of the Panhandle and Arkansas divisions of the Rock Island. In 1905 he was appointed district engineer of the Choctaw district of the latter company, which position he held until 1909, when he was made trainmaster of the Arkansas division, later being transferred to the Oklahoma division. In 1912 he was made assistant to the vice-president and six years later he was appointed chief engineer. After a year in the latter capacity, Mr. Clark was appointed assistant to the president, which position he held until 1927, when he was made vice-president.

Thomas McGee, roadmaster on the Chicago, Milwaukee, St. Paul & Pacific at Madison, S. D., who died on September 22, as noted in the November issue, was born on March 31, 1864, at Holland, Wis. Mr. McGee entered the service of the Milwaukee in 1882, as a section laborer at Chandler, Minn., being promoted in 1883 to section foreman at Foresburg, S. D., and later being transferred to Artesian, S. D. While working in this capacity he was temporarily transferred to supervise the surfacing of the Soo Line

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between St. Paul, Minn., and Sault Ste. Marie. He also had charge of extra gangs on the Southern Minnesota division during the summer seasons. In 1898, Mr. McGee was promoted to roadmaster, which position he held at the time of his death.

J. L. Suesserott, division engineer on the Staten Island Rapid Transit Lines of the Baltimore & Ohio, with headquarters at St. George, S. I., died at his home at New Brighton, S. I., on November 14. Mr. Suesserott, who was 52 years old, was born at Chambersburg, Pa., and received his higher education at Mercersburg Academy. In 1902 he entered the employ of the Baltimore & Ohio in a field engineering corps, and a few years later was promoted to assistant division engineer, with headquarters at Wheeling, W. Va. Subsequently, he was transferred to the Pittsburgh division, with headquarters at Pittsburgh, Pa. In 1920, he was transferred to the Staten Island Rapid Transit Lines as division engineer, the position he was holding at the time of his death.

Harry O. Sinsabaugh, roadmaster on the Chicago, Rock Island & Pacific, with headquarters at Topeka, Kan., died on October 10 as the result of injuries incurred in a motor car accident that took place on July 13. In the announcement of Mr. Sinsabaugh's death that appeared in the November issue, as the result of a typographer's error, it was inadvertently reported that his headquarters were at Montreal, Que. Mr. Sinsabaugh was born on December 21, 1874, at Concordia, Kan., and entered railway service with the Rock Island on April 1, 1891. He served as a section laborer and section foreman at various points on the Colorado division until May 8, 1911, when he was promoted to roadmaster. He served in this position on the Colorado and Nebraska divisions until December 1, 1914, when he was transferred to the Kansas division, where he served continuously until his death.

Johns-Manville Industrial Products—A 48-page, attractively-printed catalog, in which are listed and described the complete line of industrial products manufactured by Johns-Manville, New York, has recently been published by this company. The material listed in the catalog includes insulation, packing, refractories, roofing and siding, flooring, friction materials, electrical materials and transite pipe. The catalog is profusely illustrated with photographs drawings, tables and charts.

The Air Lift—This is the title of a 22-page attractively-printed and illustrated brochure which has recently been issued by the Ingersoll-Rand Company, New York. The brochure explains the principle of the air lift pump, points out the advantages of this method and describes how Ingersoll-Rand air compressors and air-lift pumps are adapted to various pumping conditions. The brochure contains various formulas and tables of technical information pertaining to air-lift pumping.

Supply Trade News

General

Goodell & Hoppe, First National Bank building, St. Paul, Minn., have been appointed representatives of the Railroad Sales division in the Twin Cities territory for the **Cleveland Tractor Company,** Cleveland, Ohio.

The Dearborn Chemical Company, Chicago, has purchased the **Electro-Chemical Engineering Corporation** from the **Pyle National Company,** and will operate it as a subsidiary company to market the Gunderson foam-meter and all other products of the Electro-Chemical Engineering Corporation, associated with the scientific treatment of boiler waters.

Personal

N. H. Orr, until recently a member of the staff of the American Iron & Steel Institute, New York, has been appointed general manager of sales of the **Colorado Fuel & Iron Company,** with headquarters at Denver, Colo. Mr. Orr was educated

N. H. Orr

at Carnegie Institute of Technology, Pittsburgh, and upon finishing school in 1909, entered the employ of the American Bridge Company with which company he continued until 1926, holding various positions. In the latter year he entered the employ of the Jones & Laughlin Steel Corporation, Pittsburgh, in the sales department. Later he joined the staff of the American Iron & Steel Institute where he remained until his recent appointment.

L. O. Gunderson, vice-president of the **Electro Chemical Engineering Corporation,** Chicago, on October 15, became associated with the **Dearborn Chemical Company** as assistant to the vice-president and consulting chemical engineer. He was born on August 1, 1896, at Stoughton, Wis., and was educated at St. Olaf College, Northfield, Minn., and the University of Wisconsin, where he took graduate work in metallurgy, electrochemistry, organic and industrial chemistry. He began his career in 1914 as a teacher in the public schools in Ridgeland, Wis., and during the war was attached to U. S. Naval Railway Battery No. 1 in France. In 1920, he became a chemist for Swift & Co., and in the same year was appointed chemist and water inspector for the Wabash at Decatur, Ill.

L. O. Gunderson

He held the latter position until 1922, when he became chief chemical engineer of the Alton at Bloomington, Ill., which position he held until 1928, when he became president of the Electro-Chemical Engineering Corporation, Chicago. He held the latter position until 1931, when the company was taken over by the Pyle-National Company and he was made vice- president.

Henry W. Foulds has been elected vice-president of **The Permutit Company,** New York. Mr. Foulds will correlate and direct all sales, promotion and advertising.

Thomas W. Delanty, who has been connected with the Railroad Sales division of **Joseph T. Ryerson & Son, Inc.,** Chicago, has been appointed manager of eastern railroad sales, with headquarters at Jersey City, N.J.

C. A. Cherry, assistant manager of sales, carbon bar division, of the **Republic Steel Corporation,** has been appointed district sales manager, with headquarters at New York, to succeed **Thomas B. Davies,** who has been appointed special representative of the alloy steel division at Massillon, Ohio.

Charles W. East, formerly of the Birmingham, Ala., office, has been appointed assistant manager of sales in the pipe division, succeeding **George E. Clifford,** who has been appointed district sales manager in the Los Angeles, Cal., territory. **Robert J. Working,** district sales manager in the Cincinnati, Ohio, territory, has been appointed district sales manager in the Birmingham territory, succeeding **Kenneth D. Mann,** who has resigned to become executive vice-president of the Truscon Steel Company. **Paul R. Johnston** of the Cincinnati office has been appointed district sales manager in the Cincinnati territory, to succeed Mr. Working.

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